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WILLE (H. P.). **Untersuchungen über *Psylla piri* L. und andere Birnblattsaugerarten im Wallis.** [Investigations on *P. pyri* and other Pear Psyllids in Valais.]—*Promotionsarb. eidg. tech. Hochsch. Zürich,* 113 pp., 32 figs., 80 refs. Zürich, 1950.

The Psyllids that occur on pear in the Swiss canton of Valais are *Psylla pyri* (L.), *P. pyricola* Först., *P. melanoneura* Först. and *P. pyrisuga* Först. The first is the only one of importance, and detailed descriptions are given of the morphology and anatomy of all stages of it, together with characters differentiating the four species in all stages and the summer and winter forms of the adults. Field and laboratory investigations on their bionomics and control were carried out in 1948–49.

Pear was the only food-plant of *P. pyri*. A few eggs were occasionally laid on apple in spring, but most of these failed to hatch and the nymphs all died. Adults of the summer form paired 2–3 days after emergence, and oviposition normally occurred about six days later, but was delayed for up to nearly three weeks in some cases. The duration of the normal pre-oviposition period was about the same for fertilised and unfertilised females in outdoor cages and in the greenhouse and was unaltered at temperatures between 16 and 22°C. [60·8 and 71·6°F.] and relative humidities between 50 and 80 per cent. Some of the adults of each generation flew to fresh food-plants, and almost 85 per cent. of the migrating females taken on a screen in the greenhouse contained immature ovaries. The numbers of eggs laid per female averaged 254 ; they were deposited mostly in groups of 3–15, unevenly distributed over the leaves, or sometimes on shoots of the current year or on petioles, but not on woody parts of the tree. The upper leaf surfaces were preferred in spring and autumn, and the lower surfaces in summer. The eggs apparently absorbed moisture from the plant, and dried up even at 100 per cent. relative humidity when the twigs on which they were laid were not kept in water. In the field, many eggs that were laid on the bud scales in spring dried up. At 16–22°C., the egg and nymphal stages lasted 8–10 and 20–29 days, respectively. There were five nymphal instars. During the first three, almost all the nymphs remained on the leaves, but during the fourth and fifth, migration to the shoots, fruits, or peduncles occurred. Population counts indicated that there were three generations between spring and autumn, each lasting 5–7 weeks.

The first adults of the winter form appeared in September and fed until the beginning of November, when they sought winter quarters beneath the bark of apple, plum or quince trees and sometimes on tree stumps or telegraph poles. A few of the adults paired before overwintering, but the majority did so on leaving their hibernation sites in mid-February. The females oviposited on pear at the end of February ; eggs were laid at 7–9°C. [44·6–48·2°F.] but not at 3–6°C. [37·4–42·8°F.]. Rough parts of the bark and shoots of the previous year were preferred, but eggs were occasionally laid on older twigs or bud scales. Females kept at 16–22°C. laid an average of 202 eggs each.

The bionomics of *P. pyricola* resembled those of *P. pyri*. The first eggs were laid in early March, and there were four generations a year, but the females laid an average of only 93 eggs each. It has been considered that *P. pyricola* is identical with *P. pyri*, the differences between them being due to geographical isolation [*cf. R.A.E.*, A **23** 127], but the two occur together on pear in the Valais. In cross-breeding experiments, females of either of them confined with males of the other laid non-viable eggs, indicating that fertilisation had not occurred. For these reasons and because of the lower fecundity of *P. pyricola* and the constant morphological differences found in all stages, the author retains *pyricola* as a distinct species.

The bionomics of *P. pyrisuga*, especially its overwintering habits, are not well known [*cf.* **15** 105 ; **25** 226]. Adults were not found overwintering

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beneath the bark of apple or pear, but a few were observed on *Pinus sylvestris* and *Juniperus* sp. in November 1949. Overwintered adults returned to pear between early March and mid-April, and eggs were laid from the end of March to the end of May. The egg and nymphal stages lasted 10–11 days and 5–6 weeks, respectively. The first adults of the summer form emerged at the end of May, and newly emerged adults of the first summer generation were still present in mid-August at altitudes of about 3,250–4,200 ft. The adults left pear a few days after the last moult and presumably flew to conifers. Some that were confined on pear soon after emergence died at the beginning of August and examination showed that the ovaries of the females had failed to develop and that fertilisation had not occurred.

*P. melanoneura* was common on pear and also on *Crataegus* spp. Its bionomics resembled those of *P. pyrisuga*. Shortly after the final moult, adults of the summer form migrated to conifers, on which they assumed the darker coloration of the winter form and overwintered.

The local distribution of the four species, all of which occur in the Rhône valley, is discussed, and that of *P. pyri* and *P. pyricola* is shown on a map. Adults of these two cause little damage, but the nymphs withdraw large quantities of sap and prevent vegetative growth, especially those feeding on the buds. The trees become severely weakened after infestation for several years, the fruits fall prematurely, and the copious honeydew produced favours the growth of fungi. The saliva of *P. pyrisuga* causes the leaves to roll. The nymphs of all four species were parasitised by the Encyrtid, *Prionomitus mitratus* (Dalm.), which had two generations a year. Parasitism ceased after mid-August, however, and the control afforded was slight. The eggs and nymphs were destroyed by *Anthocoris nemorum* (L.), and those of *P. pyri* also by *Orius minutus* (L.), *Camptobrochis lutescens* (Schill.) and various Coccinellids. Cases are cited of two orchards in which outbreaks of *P. pyri* were suppressed by these predators.

The literature on the chemical control of *P. pyri* and *P. pyricola* is briefly reviewed. In tests of sprays against *P. pyri* in 1948, nicotine sulphate and DDT did not kill all the nymphs and had no effect on the eggs, but 0·02 and 0·03 per cent. parathion in an emulsion spray gave complete mortality of all stages. Detailed field experiments were carried out with parathion in 1949. The results are discussed in detail and showed that treatment with 0·02 per cent. parathion at any time during the vegetative period caused high mortality of all stages, but that reinfestation occurred after intervals varying with the size of the treated area and the weather. Natural enemies were also severely reduced, and there were subsequent increases in the population of the Psyllid and also of *Paratetranychus pilosus* (C. & F.) (*Metatetranychus ulmi*, auct.). Treatment is therefore recommended only in orchards in which heavy infestation occurred in the previous year, when one application of a parathion spray before the flowering period should normally suffice.

LIEBERMANN (J.). **Segundo informe sobre el area permanente de** *Schistocerca cancellata* **(Serville) en Chile.** [A second Note on the permanent Area of *S. cancellata* in Chile.]—*An. Soc. cient. argent.* **147** pt. 5 pp. 212–230, 29 refs. Buenos Aires, 1949.

In this continuation of one section of a paper on the Acridids of Chile already noticed [*R.A.E.*, A **35** 20], the author discusses the importance of investigations on the outbreak centres of locusts and describes from observations made in January–April in 1942 and 1943 the characteristics of four areas in which *Schistocerca cancellata* (Serv.) occurred under conditions that appeared to favour the transition to phase *gregaria*, but in which, in spite of the density of the population, the locusts remained in phase *solitaria*.

RISBEC (J.). **Sur la ponte et le développement larvaire des insectes dans les cultures au Sénégal.**—*Agron. trop.* **5** no. 5–6 pp. 227–267, 10 figs., 1 ref. Nogent-sur-Marne, 1950.

The author gives a general description of the structure of insect eggs and a key to those commonly found in the field in Senegal. This is followed by a list, supplementary to one of the main pests [*R.A.E.*, A **38** 387], of 87 species of insects of minor or doubtful economic importance in Senegal. Most of them feed on plants, but a few are predacious. Notes are given on their morphology, bionomics, feeding habits and, in some cases, natural enemies.

ÇAKILLAR (M.) & NİZAMLIOĞLU (K.). **Türkiyede yeni bulunan bir** *Carpocapsa pomonella* **paraziti** *Neoplectops* (= *Craspedothricha* **End.**) *veniseta* (**Stein**). [*N. veniseta*, a new Parasite of *Cydia pomonella* in Turkey.]—*Tomurcuk* no. 14 pp. 8–9, 2 figs. Istanbul, 1953. (With a Summary in English.)

During investigations in 1951 on *Cydia* (*Carpocapsa*) *pomonella* (L.) on apple in the district of Sapanca, Turkey, ten adults of a Tachinid identified as *Neoplectops veniseta* (Stein) emerged from a collection of 533 pupae of the moth. The parasite, the adults of which are described, has not previously been recorded from Turkey.

[SHTAKEL'BERG (A. A.).] **Штакельберг (А. А.).** *Ed.* **Noxious Animals of Central Asia.** [*In Russian.*]—10½×6¾ ins., 404 pp., refs. Moscow, Akad. Nauk SSSR, 1949. Price 28 *rub.*

This handbook, to which 18 specialists have contributed, comprises an annotated list of animal pests, chiefly insects, that attack economic plants or plant products in Soviet Central Asia or that attack plants likely to be introduced there. Over 1,800 species are dealt with and they are divided into four categories, the first including pests of field crops and ornamental plants, the second pests of orchards, small fruits and vines, the third pests of forest trees, and the fourth pests of stored products, fabrics, etc. They are arranged in systematic order, with notes on synonymy, distribution, food-plants, injurious stage, and in many cases the character of the damage caused and bionomics. References to literature on ecology and biology are included for almost every species.

[VOLKOV (A. N.) & CHUDINOVA (A. N.).] **Волков (А. Н.) и Чудинова (А. Н.). The Elaboration of chemical Measures for the Control of the Bean Bruchid under Storage Conditions.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **15** pt. 9 pp. 36–41. Moscow, 1950.

In the Soviet Union, *Bruchus obtectus* Say is common along the Black Sea coast of the Caucasus and causes much damage to beans stored for seed [*cf. R.A.E.*, A **23** 570]. In the experiments described, various dusts were tested for its control in the stored seeds at a rate of 1 : 500 by weight. Laboratory-bred Bruchids were used, and the results were estimated a month and six weeks after treatment. Moribund individuals were treated as dead.

Of the three materials used undiluted, p-dichlorobenzene proved the most toxic, killing all stages in the beans within a month and adults that emerged from them in two days. Hexachloroethane and naphthalene gave 92 and 93 per cent. mortality, respectively, of all stages in six weeks, and though most of the larvae and pupae continued to develop in seeds treated with these materials, the resulting adults were all killed, most of them while still in the beans. Beans treated with p-dichlorobenzene and naphthalene became

reinfested after about five months, whereas those treated with hexachloroethane did not. Dusts of 7 per cent. of these materials in talc were slow in action, the larvae and pupae continuing their development, but most of the adults produced were killed in the seeds. The total mortality percentages after a month were 94 for hexachloroethane, 75 for p-dichlorobenzene, and 25 for naphthalene. In further tests with 7 per cent. dusts, the mortality percentages after a month were 94 for DDT, 96 for BHC, 95 for a fused mixture of BHC and hexachloroethane (1 : 1), and 90 for a fused mixture of BHC and DDT (2 : 1). A 5 per cent. DDT dust (Gesarol) gave 95 per cent. mortality. The moisture content of the beans was not apparently an important factor, as toxicity was the same at 15·5 and 18·5 per cent. moisture. The 7 per cent. dusts of BHC, DDT and the fused mixtures were still as effective 6½ months after treatment. When applied directly to the adult beetles, these materials, the 5 per cent. DDT dust, and undiluted hexachloroethane gave complete mortality in 3–4 days, whereas undiluted p-dichlorobenzene and naphthalene were less effective, owing to their bad adhesiveness and high volatility. The toxicity of the last three was decreased in the 7 per cent. dusts. The only material that reduced the germinating power of the seeds was undiluted p-dichlorobenzene, which caused 10 per cent. reduction in three months.

It is concluded that insecticidal dusts are suitable for treating bean seeds stored on collective and state farms.

[Vaniev (A. D.).] **Ваниев (А.Д.). An Experiment on the Control of agricultural Pests by Means of an Insecticide that penetrates into the Tissues of Plants.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 3 pp. 43–48, 3 refs. Moscow, 1951.

Investigations were carried out near Moscow in 1950 on the effectiveness of parathion as a systemic insecticide against pests of wheat. In tests against *Toxoptera graminum* (Rond.), infested plants growing in water culture were first used. The addition of 0·01 per cent. parathion to the water reduced the Aphid population, but the plants soon died. Effectiveness varied much with temperature, Aphid mortality being almost complete in a day at 25–32°C. [77–89·6°F.] but negligible in two days at 9–12°C. [48·2–53·6°F.]. In experiments at 20–33°C. [68–91·4°F.], infested plants were grown in pots each containing 2 kg. soil. The plants were approaching the ear stage, and at a time when they were wilting from lack of water, 200 cc. 0·1 or 0·2 per cent. parathion was applied to each pot. The treatments resulted in complete mortality of the Aphids in 24 hours, and though infestation reappeared after five days, it remained very low. Lower concentrations of parathion were not so effective. The treatments caused no injury to the plants and even seemed beneficial. Further tests with plants in different stages of development indicated that the effectiveness of the treatment decreased with the degree of maturity, 0·6 per cent. parathion proving effective only after three days and soon losing its toxicity in plants with ripe ears. Although the compound gradually lost its toxicity in all the plants, the latter ceased to attract Aphids.

When 1 per cent. parathion dust was added to soil in pots at rates equivalent to 2·25–5·4 lb. parathion per acre and wheat seedlings were transplanted into them, the plants developed much better than the controls, and examination for Aphids at intervals for 38 days showed that they were substantially protected from infestation, the Aphids that settled on them dying or leaving in 1–2 days, whereas the controls became heavily infested. When parathion was applied in water to the basal part of the leaves, all the Aphids on the leaves disappeared in 24 hours, and when it was applied to the stem, they disappeared from the whole plant in 1–3 days. Application to the top part of the leaves had no effect on Aphids on the lower parts.

To test the effect of parathion on the larvae of *Oscinella frit* (L.) and *Chlorops pumilionis* (Bjerk.), wheat plants grown outdoors were watered with it at various concentrations and rates, and the plants were subsequently dissected and the larvae counted. In one experiment in which the temperature was 23–26°C. [73·4–78·8°F.] and the moisture content of the soil 30 per cent., 14 larvae of *O. frit* out of a total of 18 were dead six days after treatment with 0·02 per cent. parathion at a rate giving 2·25 lb. toxicant per acre, and in another at 20–22°C. [68–77°F.] and 50 per cent. soil moisture, 0·06 per cent. parathion applied at 6·75 lb. toxicant per acre gave complete mortality of larvae of both *O. frit* and *C. pumilionis* in 20 days.

[Galakhov (P. N.).] **Галахов (П. Н.). A Pest of Sesame—the Grass Bug (*Lygus pratensis* L.) and its Control.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 6 pp. 22–24, 3 refs. Moscow, 1951.

*Sesamum orientale* is attacked in the Soviet Union by *Lygus pratensis* (L.), which appears on the plants shortly before or at the flowering stage and feeds on the aerial parts. Populations normally average five per plant, but range up to 30. The feeding punctures cause the leaves to wither and the capsules to become deformed and kill the growing points, which induces intense formation of lateral shoots. Observations in which 5 or 30 examples of the Mirid were confined on single plants at the beginning of flowering showed that in addition to affecting growth, they reduced the average yield of seed per plant to 3·8 and 1·6 gm., respectively, as compared with 7 gm. for uninfested plants. Following a laboratory cage test in which dusts of 5 per cent. DDT or BHC in talc at 18 lb. per acre killed 90 per cent. of the bugs, these materials were applied in the field. The mortality percentages were 53·2, 88·8 and 89·8 for 5 per cent. DDT at 9, 18 and 27 lb. per acre, respectively, and 57·2, 91·7 and 91·8 for 5 per cent. BHC at the same rates. The plants were not injured by either of the dusts.

[Yakhontov (V. V.).] **Яхонтов (В. В.). The Speckled Bronze Beetle (*Oxythyrea cinctella* Schaum)—a polyphagous Pest of Field Crops, Fruit and ornamental Plants in Central Asia.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 6 pp. 25–28, 6 refs. Moscow, 1951.

Observations near Tashkent in 1943–48 showed that the Cetoniid, *Oxythyrea cinctella* (Schaum), is a polyphagous pest [*cf. R.A.E.*, A **30** 138], the adults feeding on the buds and flowers of various field crops, such as wheat and cucurbits, apple, rose and other ornamental plants, and weeds. There was only one generation a year. The adults left the soil in late April or early May, fed for 5–6 weeks before becoming sexually mature, paired in early June, and died out at the beginning of July. They were active by day, and flight occurred at temperatures of 20–25°C. [68–77°F.] or above. Eggs were laid from about mid-June, in soil rich in decomposing vegetable matter, and hatched in 5–6 days at 20–25°C., or longer if the soil was dry. The larvae fed on decomposing vegetable matter and were not injurious. Pupation occurred in the last ten days of August in earthen cells in the soil, and the adults emerged in mid-September, and overwintered in the cells.

Control experiments were carried out on various ornamental plants and weeds. The best results were given by a dust of 7 per cent. BHC, which gave complete mortality of adults in three hours in the laboratory and 90–100 per cent. in 12 hours in the field. Sodium-fluosilicate dust gave complete mortality in 24 hours in nine laboratory tests out of ten, and 90–95 per cent. in 48 hours in the field. Calcium arsenate was less effective, and a dust of 5 per cent. DDT and a pyrethrum dust and spray were unsatisfactory.

[Semenov (A. E.).] **Семенов (А. Е.). The Effectiveness of applying Hexachlorane Dust at reduced Concentrations for the Control of the Cabbage Fly.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 10 pp. 35–38, 8 refs. Moscow, 1951.

Dusts of 6 and 12 per cent. BHC were compared against the cabbage fly [*Hylemyia brassicae* (Bch.)] on cabbage in 1949 at Igarka, on the river Yenisei in the Arctic region [*cf. R.A.E.*, A **41** 9]. Oviposition began on 8th July, reached a peak on 17th July, and continued till early August. The two dusts were applied by hand to the stems of the plants and the soil round them at rates of 0·5 and 0·25 gm. per plant, respectively, and 1–3 applications were made at intervals of ten days. The percentages of plants killed by the fly were 36·5 for no treatment, 0 for three applications of the 6 per cent. dust, and 1·65–5·15 for the other treatments. Both dusts appeared to stimulate the growth of the plants, and the weight of the cabbage heads obtained increased with the number of applications.

[Bogush (P. P.).] **Боруш (П. П.). Changes in the Toxicity of Hexachlorane in Relation to Temperature.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 10 pp. 39–42, 1 ref. Moscow, 1951.

The effect of temperature on the toxicity of a dust of BHC (12·45 per cent. mixed isomers) was tested in the laboratory in Turkmenistan in March–May 1951, field-collected adult weevils of the genera *Sitona* and *Hypera* (*Phytonomus*) being the test insects. The dust was applied in an apparatus at the rate of 36 lb. per acre to glass or filter paper, which was then kept in darkness at constant temperatures ranging from 15 to 70°C. [59–158°F.] for periods varying from 15 minutes to 16 hours. The weevils were subsequently held on the treated surfaces and then transferred to cages and kept at 16–21°C. [60·8–69·8°F.]. Mortality was estimated 1–7 days later. The controls consisted of weevils exposed to untreated surfaces, among which there was little or no mortality, and weevils exposed to the treated surfaces immediately after application of the dust, all of which died in all tests within the first 1–3 days.

In the first series of tests, toxicity to *Sitona* was not affected by exposure of the dusted surfaces to 15 or 25°C. [59 or 77°F.] for four hours, but was somewhat reduced by similar exposure to 40°C. [104°F.] and almost eliminated at 55°C. [131°F.]. When the storage temperature was 55°C., toxicity was not much affected by exposure for 15 or 30 minutes, but was greatly reduced after 1 and 2 hours. Against *Hypera*, toxicity was little affected by storage for four hours at 40°C., but was almost eliminated at 55 and 70°C.; it was also strongly reduced after two hours at 55°C., but unaffected at 16°C. In further tests against *Sitona*, toxicity was not affected by exposure to 18°C. [64·4°F.] for 4–16 hours, was somewhat delayed at 30°C. [86°F.], and was greatly reduced after 4, 8 and 16 hours at 40°C., with little difference between exposures of 8 and 16 hours. When the dust was applied to glass, tin, wood, waxed paper and soil, and kept for four hours at 55°C., there were no differences in toxicity attributable to the nature of the surface, and storing a dusted surface in the dark for 4–13 days at 17–19°C. [62·6–66·2°F.] after exposure to 55°C. for 2–4 hours did not restore its toxicity to either species.

When the dust was kept in glass jars for four hours at 47–51°C. [116·6–123·8°F.] or three hours at 60–64°C. [148–155·2°F.], before being applied to the surface and tested against *Hypera*, complete mortality was obtained in 24 hours. It is concluded that noticeable reduction in the toxicity of BHC dust deposits takes place at temperatures of 30–40°C., and that prolonged exposure to 55°C. practically destroys their insecticidal power.

[Sheftel' (I. M.).] **Шефтель (И.М.). Contribution to the Biology of the Peach Moth in the Crimea.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 12 pp. 26–29, 5 figs. Moscow, 1951.

Though *Cerostoma persicellum* (F.) causes considerable damage to peach in the Crimea, little is known of its bionomics. The larvae appear on the half-opened leaves in April, when the temperature reaches 20°C. [68°F.], and feed on them, causing shedding of the young fruits and a reduction in the size of the harvested peaches. The trees produce new leaves, but become exhausted in the process, so that the production of fruit buds and hence the crop in the following year are reduced. The larvae were also observed injuring almond, and in the laboratory, they fed on the leaves of plum, but not on those of cherry or apricot. The larvae, pupae and adults are briefly described. Observations begun in 1947 showed that there is only one generation a year. The larvae pupate at the end of April and the beginning of May in cocoons on the bark of the trunk and branches. The pupal stage lasted 16–23 days, with an average of 18, depending on temperature and humidity, and mass emergence of the adults occurred in the last ten days of May. It was not known when the eggs were laid or in what stage hibernation occurred.

For control, a DDT spray is recommended, the first application to be made when the leaf buds open and the second when the leaves are unfolding.

[Romanova (Yu. S.).] **Романова (Ю.С.). The Biological Control of *Malacosoma neustria*.** [*In Russian.*]—*Dokl. vsesoyuz. Akad. sel.-khoz. Nauk Lenina* **16** no. 12 pp. 30–34. Moscow, 1951.

*Malacosoma neustria* (L.) is a common pest of fruit, shade and forest trees in the temperate and southern regions of the Soviet Union, and since the available methods of control are insufficient, the possibility of making use of its parasites was considered. Observations in 1948 near Moscow showed that some 60 per cent. of the cocoons were parasitised, and several species of *Pimpla* were bred from them, together with *Theronia atalantae* (Poda) (a parasite of *Pimpla*), *Pteromalus puparum* (L.), and various Tachinids. Special attention was paid to egg parasites, which attacked an average of 32 per cent. of the egg batches in 1948. The species chiefly responsible was *Telenomus laeviusculus* (Ratz.). The eggs were parasitised by *T. laeviusculus*, *T. terebrans* Mayr, *Ooencyrtus tardus* (Ratz.) and a species cited as *O. concinnus* [the description of which has not been traced at this Institute] in Bashkiria, where the percentage of egg masses attacked was 20–39 in 1948 and 66–73 in 1949, and by *O. tardus*, *O. concinnus*, *O. masii* (Merc.) and *Anastatus bifasciatus* (Boy.) at Simferopol, in the Crimea, where it was 80 in 1949. As a result of the activity of these parasites, the population of the moth was greatly reduced in all these places in 1950. The rate of parasitism was higher in old orchards than in young ones in which the trees were not yet bearing fruit.

The adults of *T. laeviusculus*, which are described, emerged from the eggs of *M. neustria* in orchards near Moscow in the first half of June, almost at the same time as those of the host. Males were not observed, but occurred in small numbers in the other regions. The eggs were laid singly in the host eggs in July and August, and total development lasted 11 months, prepupae being formed in September and overwintering. Optimum conditions for the pupae in spring were a temperature of 23–30°C. [73·4–86°F.] combined with 70–90 per cent. relative humidity. Excessive dryness of the air was fatal, and strong winds that caused the eggs to dry up were also unfavourable. During spring and summer, the development of the parasite could be retarded by keeping parasitised eggs at 4°C. [39·2°F.] and 60–70 per cent. relative humidity.

In 1950, egg parasites were introduced from regions in which they were abundant into various orchards in the town of Ufa, in Bashkiria, where they

were scarce, a total of 15,000 parasitised egg batches of *M. neustria* being distributed. Adult parasites were numerous in the summer, and subsequent parasitism of the eggs of the pest was heavy. Practical recommendations are given concerning the transport of the egg parasites, their release in infested orchards, etc., and the preservation of parasitised eggs in winter.

[Lekić (M. B.).] **Лекић (М. Б.). The Biology of the Codling Moth on the Territory of the Serbian People's Republic and Measures for its Control.** [*In Serbian.*]—*Plant Prot.* **1** no. 1 pp. 32–65, 10 figs., 2 graphs, 11 refs. Belgrade, 1950. (With a Summary in English.)

Investigations in central Serbia in 1947–49 showed that *Cydia* (*Enarmonia*) *pomonella* (L.) reduces the production of fruit there by 20–25 per cent. ; the yield of apples and pears is reduced by 50–70 per cent., but damage to stone fruits and walnut is much less. In studies on the bionomics of the moth on apple, there were two overlapping generations a year and sometimes a partial third. Adults were present throughout the vegetation period. Those of the overwintering generation emerged from the beginning of May to mid-July, with a peak in May, those of the first generation from early July to the end of August, and those of the second at the end of August and the beginning of September. Second-generation adults did not reproduce if conditions were unfavourable. Males were somewhat more numerous than females. Of the overwintering larvae, 25 per cent. were killed by parasites or unfavourable weather, 68 per cent. gave rise to adults in the first spring, and 7 per cent. remained in diapause for a further year. Of those that remained in diapause, 32 per cent. gave rise to adults in the second spring, and the rest died. Pupation of the overwintered larvae occurred in the second half of April, and the pupal stage lasted 12–20 days. Pairing began 2–3 days after emergence, and eggs were laid soon after, singly or in groups of 2–7 on leaves, twigs or fruits. Most eggs were obtained from females reared at 20–25°C. [68–77°F.] and 70–75 per cent. relative humidity. Temperatures above 25°C. reduced oviposition, and those above 30°C. [86°F.] caused sterility. In dry weather, when the relative humidity was below 40 per cent., or when exposed to direct sunshine, many of the eggs died. The larvae hatched in 10–18 days in spring and in 5–6 days in July and August, and became full-fed in 17–36 days, with a mean of 23–25. Before spinning their cocoons, they wandered for several hours or even days in search of suitable sites. Most settled in positions on the trunks or branches that were sheltered from the wind. The pupal stage of the first generation lasted 7–12 days. Daily examinations of fallen fruits showed that they harboured 20–25 per cent. of the first-generation larvae and 15 per cent. of those of the second. About 20–26 per cent. of the infested fruits remained on the trees, and some 8–10 per cent. of the larvae were still in the fruits when these were placed in storage.

The phenology of apple or pear gave little indication of the time when control measures should be applied, because of the differences between varieties. The most reliable information was obtained from observations of adult emergence in cages in the orchard and the intensity and duration of the flight in individual districts. In experiments in 1948, good control was given by four applications, the first made 13–15 days after adult emergence began and the others at intervals of 20–25 days, of sprays of 0·4 per cent. lead or calcium arsenate with a colloidal resin adhesive, 0·05 per cent. DDT in an emulsified solution, or a proprietary pyrethrum preparation, which reduced the percentage infestation to 11·1–15·2, as compared with 52·3 for no treatment. Dusts of DDT or BHC were much less effective. In 1949, the sprays were applied twice and bands treated with β-naphthol were placed on the trees in mid-June, to trap the first-generation larvae migrating to pupation sites. Infestation at harvest averaged only 1·28 per cent., as compared with 48 per cent. for no treatment.

Melis (A.). **Esperimenti di lotta antidacica con insetticidi a base di DDT e di $C_6H_6Cl_6$ nella Toscana litoranea nel 1948.** [Experiments with DDT and BHC against *Dacus oleae* on the Coast of Tuscany in 1948.]—*Redia* **34** pp. 1–34, 1 fig., 7 refs. Florence, 1949.

The author describes further experiments in Tuscany in 1948 on the value of proprietary preparations of DDT and BHC against *Dacus oleae* (Gmel.) on olive [*cf. R.A.E.*, A **39** 72]. The treatments were applied to plantings of relatively small area among larger ones, in order to ascertain their protective power. Infestation began at the beginning of July, and the trees were sprayed with 2 per cent. Toxin or Fruttasan (preparations containing 12 per cent. wettable BHC and DDT, respectively) during the first half of July, in mid-August, and at the middle and the end of September, rain following all but the first application, or with Politox (a mixture of DDT and BHC of unstated concentration) in mid-July, mid-August (twice owing to rain), mid-September and the beginning of October. None of the materials proved effective, the final infestation being as heavy on treated as on untreated trees, though Politox gave some protection until mid-September. A bait-spray of an emulsified solution of BHC and molasses applied in mid-July proved equally ineffective. It is suggested that the poor results may have been due to the loss of deposits following rain and the severity of the infestation.

Ciampolini (M.). **Osservazioni sulle tracce lasciate da alcuni insetti sopra superfici trattate con polveri al DDT.** [Observations on the Traces left by some Insects on Surfaces treated with DDT Dusts.]—*Redia* **34** pp. 35–45, 6 figs. Florence, 1949.

When a DDT dust was applied against larvae of *Anthrenus* and *Attagenus*, adults of *Bruchus* (*Laria*) *rufimanus* Boh., *Ptinus latro* F., *Gibbium psylloides* (Czenp.) and *Ctenolepisma targionii* (Grassi & Rovelli), and spiders in a room in Florence in 1949, it was observed that characteristic tracks were left by the arthropods on the dusted surfaces. These are illustrated, and it is pointed out that such tracks might be used to identify the insects making them and to indicate their reactions to the poison. A DDT spray was applied a week later, and the combined treatment gave good control.

Antongiovanni (E.). **Prove sulla persistenza di attività del DDT e dell' esacloro-cicloesano nei confronti del *Dacus oleae* Rossi.** [Tests on the persistent Effects of DDT and BHC against *D. oleae* (Gmel.).]—*Redia* **34** pp. 47–66, 1 ref. Florence, 1949.

Laboratory experiments were made in October–December 1948 in Italy on the duration of effectiveness of DDT and BHC deposits against the adults of *Dacus oleae* (Gmel.). In the main tests, the insecticides were applied to petri dishes or the upper surfaces of olive leaves and the insects were exposed to them immediately or after various periods, sometimes after artificial weathering. In the petri dishes, deposits from a spray of 0·2 per cent. DDT maintained their effectiveness for over a week, even after exposure to wind for 20 hours or constant illumination at 40°C. [104°F.]. Sprays of 0·25 or 0·2 per cent. DDT or 0·02 or 0·012 per cent. γ BHC gave very good results on the day of application and maintained their efficiency for six days, even when kept at 40°C. BHC at the lower concentration was somewhat inferior to the others. Further tests with the stronger DDT and BHC sprays showed that BHC was the more rapid in action immediately after application but less rapid than DDT after six days, particularly when it was exposed to artificial weathering. When 0·1 per cent. DDT was compared with 0·006 per cent. γ BHC, the former retained its toxicity after six days with weathering, but the latter did not. In the tests with olive

leaves, the latter were sprayed with 0·2 per cent. DDT and some of them were thoroughly wetted once or twice on the following day to simulate heavy rain. Two days after spraying, adults of *D. oleae* were placed on the leaves in petri dishes, and the results showed that mortality was much lower on the leaves that had been wetted than on those that had not. Similar tests with leaves treated with a 5 per cent. DDT dust and a 0·2 per cent. DDT spray showed that the efficiency of both materials was impaired by wetting, especially that of the dust, which gave poorer results after wetting for ten minutes than did the spray after four hours.

In the final tests, leaves were taken from trees 6–33 days after they had been dusted with 5 per cent. DDT or sprayed with 0·25 or 0·2 per cent. DDT or 0·02 or 0·012 per cent. γ BHC. All the DDT treatments were effective after 33 days, even when no visible deposit was left. The stronger BHC spray was more effective than DDT soon after application, but even leaves still showing visible residues gave no mortality after 33 days.

VENTURI (F.). **La *Coleophora ciconiella* H.-S. e le basi della lotta contro gli insetti delle graminacee cerealicole.** [*C. ciconiella* and the Principles of Insect Control on cultivated Graminaceae.]—*Redia* **34** pp. 75–82, 3 figs., 6 refs. Florence, 1949.

*Coleophora ciconiella* H.-S. was observed injuring cereals in Italy for the first time in the winter of 1948–49, when it was found attacking wheat and oats in the Provinces of Leghorn and Pisa. The larvae mine small areas in the leaves, but do not leave their cases while doing so. From observations made in the laboratory, it appeared that each larva makes at least ten mines. The larvae overwinter and pupate in spring. Control is difficult, since chemical treatment of cereal crops is not usually practicable or advisable.

MELIS (A.). **Nuovo contributo alla ricerca dei mezzi di lotta per combattere gli individui della generazione carpofaga della tignola dell'olivo (*Prays oleellus* F.).** [A new Contribution to the Study of Control Methods against the fruit-infesting Generation of the Olive Moth (*P. oleellus*).]—*Redia* **34** pp. 83–123, 12 figs., 3 refs. Florence, 1949.

The author repeats his previous recommendations for the control of *Prays oleellus* (F.) on olive in Italy [*R.A.E.*, A **40** 283] and gives a detailed account of experiments made near Florence in 1948. Sprays of nicotine (as nicotine sulphate or the alkaloid) at the concentrations normally used against Aphids and thrips were applied on 17th June, when the deposition of second-generation eggs had just begun, or on 17th and 19th June, and the same with the addition of 0·5 per cent. lead arsenate on these dates and 20th–23rd June or on the first or first and second of them. Counts showed that the percentages of dead larvae in samples of fruits taken from trees of different varieties were 64–86 for nicotine alone and 75–83 for nicotine with lead arsenate five days after application on the first date only, as compared with 5 for no treatment, and 65–71 and 82–87 for one and two applications of the nicotine spray alone and 65–80, 83–84 and 88–90, for one, two and three applications of nicotine with lead arsenate, respectively, 14 days after the first application, as compared with 8–9. Among fallen fruits examined on 2nd July, the percentages infested were 24·8–36·8 under treated trees and 74–77·7 under untreated ones, the lowest percentages being in fruits under trees given three applications of nicotine with lead arsenate. Further counts showed that 17·3–21·9 per cent. of the fruits on treated trees on 19th June had fallen by 21st August, as compared with 30·3 for untreated ones, and the percentages of those that were infested varied from 1·9 for three applications of nicotine with lead arsenate to 8·3 for one of nicotine alone and was 19·8 for no treatment. Counts of the olives

left on the trees on 25th July showed that 12–17 per cent. of those on the untreated trees and 3–8 per cent. of those on the treated ones were infested ; 4·2–7 and 0·2–2 per cent., respectively, fell between 24th August and 30th September, three applications of nicotine with lead arsenate again giving the best results. The total percentages of fallen fruits after the autumn count were 34·1 for no treatment, 24·5 for two applications of nicotine alone and 22·1, 24·7 and 19·3 for one, two and three applications, respectively, of nicotine with lead arsenate. It was estimated that the yield of undamaged olives from treated trees was 14·6–22·4 per cent. greater than that from untreated ones.

VENTURI (F.). *Pseudonapomyza dianthicola* **n.sp. (Dipt. Agromyzidae) minatrice delle foglie di garofano.** [*P. dianthicola*, sp.n., mining the Leaves of Carnation.]—*Redia* **34** pp. 161–164, 5 figs., 1 ref. Florence, 1949.

CIAMPOLINI (M.). **Osservazioni sull'etologia della** *Pseudonapomyza dianthicola* **Venturi (Diptera Agromyzidae).** [Observations on the Bionomics of *P. dianthicola*.]—*T.c.* pp. 289–301, 5 figs., 1 ref.

In the first of these papers, the author describes the adults of both sexes of the Agromyzid, *Pseudonapomyza dianthicola*, sp.n., the larvae of which mine the leaves of carnation in Italy, and gives characters distinguishing it from *P. atra* (Mg.).

In the second, an account is given of observations near Pistoia in 1949 on its bionomics. Seven generations occurred in the year and winter was passed in the pupal stage. The adults emerged in April, and all stages were present from June to October, the egg, larval and pupal stages lasting 2–4, 8–13 and 8–14 days, respectively. The eggs were inserted in the parenchyma of the leaves, usually on the lower surfaces, and the larvae mined the leaves. The mines were up to 2–3 ins. long and were normally confined to the lower surfaces. When fully fed, the larvae left the plants and pupated beneath the surface of the soil. In a heavy infestation, up to 6–8 mines were observed in a single leaf and the flower stalks were also attacked. Infestation decreased the production of flowers and impaired their value. Parasites reared from the Agromyzid comprised *Halticoptera patellana* Dalm., which parasitised 25 per cent. of the pupae, and *Solenotus isaea* (Wlk.), and *Achrysocharis formosa* (Westw.), which parasitised 20 and 0·5 per cent. of the larvae, respectively. Dusting with DDT proved effective against the adults, particularly when done early in the season, before the generations overlapped, but no method of controlling the larvae was found. Cultivation of the soil in winter destroys the hibernating pupae.

SERVADEI (A.). **Contributo allo studio dei Tentredinidi (Hymenoptera Symphyta) delle rose. V.** *Blennocampa pusilla* **Klug.** [A Contribution to the Knowledge of the Sawflies of Roses. V. *B. pusilla*.]—*Redia* **34** pp. 165–216, 30 figs., many refs. Florence, 1949.

In this part of a series [*R.A.E.*, A **21** 267 ; **22** 364 ; **25** 213, 214], the author describes the egg, larva and adults of *Blennocampa pusilla* (Klug) and gives an account of its bionomics on rose in Tuscany, where it caused considerable damage in 1948 and 1949. There is only one generation a year, and the adults appear in the first half of April. The females repeatedly puncture the leaves with the ovipositor and then insert their eggs into them. The punctures cause the leaves to curl up after about 24 hours. The larvae, which hatch in about 5–6 days, feed on the leaves and become fully fed at the beginning of May, when they enter the soil and overwinter, pupating in the following March. Sprays of DDT applied to the plants at the time of oviposition are recommended for control.

Venturi (F.). **La costruzione del bozzolo da parte della larva matura di *Lema melanopa* L. (Coleoptera Chrysomelidae) ed elementi di anatomia del suo tubo digerente.** [The Construction of the Cocoon by the mature Larva of *L. melanopa* and anatomical Features of its alimentary Canal.] —*Redia* **34** pp. 217–231, 7 figs., 10 refs. Florence, 1949.

The author records investigations showing that the liquid used by the larva of *Lema melanopa* (L.) in the construction of the earthen cell in which it pupates [*cf. R.A.E.*, A **36** 37] originates in the anterior part of the alimentary canal, describes the digestive tube of the full-fed larva of *L. melanopa*, and compares its pupation habits with those of other Criocerids.

Pegazzano (F.). **Un diaspino nuovo per la fauna paleartica : *Pseudaonidia paeoniae* Cockll. (Hemiptera, Coccidae). Nota preventiva.** [A new Diaspine for the Palaearctic Fauna, *P. paeoniae*. Preliminary Note.] —*Redia* **34** pp. 233–235, 5 refs. Florence, 1949.

*Pseudaonidia paeoniae* (Ckll.), which has not previously been recorded from Europe, was found on azalea and *Camellia japonica* near Florence in May 1949. It appeared to have been present there for several years.

Martelli (M.). **L'esaclorocicloesano nella lotta contro le larve ipogee del *Pentodon punctatus* Vill. (Coleoptera Scarabaeidae).** [BHC in the Control of the underground Larvae of *P. punctatus*.]—*Redia* **34** pp. 303–311, 3 figs., 14 refs. Florence, 1949.

Grape-vine cuttings in a vineyard near Florence were severely damaged by larvae of *Pentodon punctatus* (Villers). The adults of this Dynastid normally appear from March to July and are polyphagous. The females lay 20–30 eggs each in the soil near their food-plants. The larvae hatch in 10–15 days and feed on the roots of numerous plants, migrating from one to another. The duration of the larval stage ranges from 2–5 months to over a year and the pupal stage is completed in 2–3 weeks.

In tests against the larvae, three BHC products were applied to give 0·2, 0·45 and 1·2 gm. BHC, respectively, per plant. The first product was a 5 per cent. dust that was scattered round each plant and then watered in, and the others were 12 and 20 per cent. wettable powders that were applied to the soil in water. Inspection after a few days showed that the last two gave complete mortality, but the first did not and there were indications that it was repellent. The treatments did not harm the plants.

Ciampolini (M.). **La comparsa in Italia del *Paratetranychus ununguis*, Jacobi (Acarina Tetranychidae).** [The Presence of *P. ununguis* in Italy.]—*Redia* **34** pp. 339–346, 3 figs., 12 refs. Florence, 1949.

In August 1949, *Paratetranychus ununguis* (Jac.), which had not previously been recorded from Italy, was found to be causing severe damage to spruce (*Picea abies* (*excelsa*)) in a forest nursery near Pistoia, many of the young plants being killed by the attack. It was also observed on larch. Notes are given on the morphology, bionomics, geographical distribution and food-plants of this mite. Two applications ten days apart of a spray of hexaethyl tetraphosphate gave almost complete mortality.

Boselli (F.). **Stato presente delle conoscenze su** *Loxostege* (*Phlyctaenodes*) *sticticalis* **L., lepidottero dannoso ai medicai irrigui in Sardegna.** [The present State of Knowledge on *L. sticticalis* damaging irrigated Lucerne in Sardinia.]—*Ann. Sper. agr.* (N.S.) **5** no. 6 pp. 1247–1285, 3 figs., 95 refs. Rome, 1951. (With a Summary in English.)

*Loxostege sticticalis* (L.), which had not previously been recorded from Sardinia, caused serious damage to permanent plantings of irrigated lucerne in a reclaimed area near Arborea in 1942–49. The author briefly describes all stages of this Pyralid and discusses from the literature its bionomics, world distribution, wild food-plants, parasites and control. Observations at Arborea showed that there were at least three complete overlapping generations a year and a partial fourth. The larval stage lasted 11–15 days and the life-cycle about a month during the summer. Damage by the first generation was slight, but the later ones caused serious losses, the larvae feeding on the young tips and subsequently webbing the terminal leaves together. After destroying one field, they sometimes migrated in large numbers to another.

The difficulty of applying control measures under local conditions in Sardinia is discussed. In tests, several fields were sprayed with 1 per cent. sodium arsenite immediately after the lucerne was cut, but some of the larvae had already entered the soil to pupate, so that control was not satisfactory. If applied earlier, this treatment should give good results. Other measures recommended are ploughing to a depth of at least 2 ins. in autumn, winter or spring, the introduction of crop rotation, and the establishment of shelter belts to limit migration of the adults.

Santoro (R.). **Ricerche con prodotti organico-sintetici in rapporto a** *Dacus oleae*, **a entomoparassiti ed insetti varii eseguite en Ascea (Salerno) nel 1950.** [Investigations with synthetic organic Products against *D. oleae*, its Parasites and other Insects made in Ascea (Salerno) in 1950.]—*Ann. Sper. agr.* (N.S.). **5** no. 6 pp. 1379–1404, 2 refs. Rome, 1951. (With a Summary in English.)

The investigations described were carried out in connection with experiments in 1950 on the control of *Dacus oleae* (Gmel.) on olive near Salerno, Italy. The first concerned the effect of chlorinated insecticides on the whole insect fauna of the trees. Single trees were sprayed four times, on 2nd–4th and 30th August, 11th September and 5th October, with 50 per cent. colloidal DDT paste and three emulsion concentrates containing, respectively, 50 per cent. chlordane, 25 per cent. each of DDT and BHC, and a mixture of 32 per cent. chlordane and 18 per cent. DDT, all at 4 lb. per 10 gals. water. Sheets were spread beneath the trees after each application and the insects that fell on to them were counted at intervals. The results, which are shown in detail in tables, indicated that all the sprays were toxic to ants (mostly *Crematogaster scutellaris* (Ol.)), Coccinellids, *Phloeotribus scarabaeoides* (Bernard)] and adults of *D. oleae*, but did not kill large numbers of the Hymenopterous parasites of *Dacus*, though these were scarce locally. The numbers of insects killed were very variable but usually declined fairly rapidly after the first day. A laboratory test in which adults of *D. oleae* were confined with twigs that had been sprayed with the four materials 6–17 days previously and food was provided for them showed that though deposits of chlordane and the mixture of chlordane and DDT gave complete mortality more quickly than DDT or the mixture of DDT and BHC after six days, these last two materials maintained their efficiency unimpaired to the end of the experiment, while that of the first two decreased slightly.

In further field observations, bait-pans were hung in sprayed and unsprayed trees and the numbers of *D. oleae* taken were recorded. The optimum temperatures for the development of the Trypetid are 16–24°C. [60·8–75·2°F.] and infestation began in June but was slight in areas in which the temperature averaged about 30°C. [86°F.] until September, when temperature, humidity and the state of the olives were all favourable and infestation became heavy. Trees sprayed with chlordane had no repellent effect on the adults, but fewer were taken in the pans on those treated with the mixtures of DDT with chlordane or BHC, and many fewer on those sprayed with colloidal DDT, than in the controls. Any visible coating on the trees is repellent, and treatment by the method of Russo [*R.A.E.*, A **26** 350] was also very effective. In general, more females were taken than males, especially in the autumn. The yield of oil from trees treated with colloidal DDT or the mixture of DDT and BHC was about 40 per cent. greater than that from untreated trees, and the quality of the oil was better.

When olives from trees sprayed with 0·04 per cent. parathion were examined it was found that only the larvae in the very earliest stages, and consequently those nearest the surface of the fruits, had been killed, while those further in continued to develop normally. In some cases the eggs had been killed.

Romano (E.) & Giulimondi (G.). **Rapido controllo del titolo nelle polveri bagnabili contenenti parathion.** [The rapid Determination of Parathion Content in wettable Powders.]—*Ann. Sper. agr.* (N.S.) **5** no. 6 pp. 1527–1531, 1 ref. Rome, 1951. (With a Summary in English.)

The authors describe a rapid method of determining the content of parathion in wettable powders based on extraction with ethyl ether, hydrolysis with sodium hydroxide and colorimetric estimation of the resulting p-nitrophenol salt, and show that the results are very accurate for small quantities.

Romano (E.). **L'evaporazione, alla luce, del DDT e dell'octacloro.** [The Vaporisation of DDT and Chlordane exposed to Light.]—*Ann. Sper. agr.* (N.S.) **5** no. 4 pp. 785–789, 2 graphs. Rome, 1951. **Evaporazione, alla luce, degli insetticidi clorurati organici. Nota II.** [The Vaporisation of chlorinated organic Insecticides exposed to Light. Note 2.]—*T.c.* no. 6 pp. 1537–1539, 1 ref. (With Summaries in English.)

In the test described in the first of these papers, 4 per cent. solutions of DDT and chlordane in a volatile solvent were placed in petri dishes at the rate of 2·5 cc. per dish 64 sq. cm. in area. After 24 hours, when the solvent had evaporated and a smooth deposit was left, the dishes were placed under a sun lamp and continuously exposed to a constant temperature of 50°C. [122°F.]. They were weighed daily and it was found that the loss in weight of deposit after 10 days was 14 per cent. for DDT and 76 per cent. for chlordane. In a further test, described in the second paper, three commercial wettable powders containing 50 per cent. chlordane were sifted into the dishes and exposed as before. The percentages of weight loss after 10 days were 90, 86 and 85, showing that the inert ingredients in the powders had slightly different effects on the rate of vaporisation but that this rate was higher than that for chlordane alone, probably owing to the less even surface of the powders.

Vives Comallonga (J. L.) & Bardía Bardía (R.). **La** *Evetria* (*Tortrix, Retinia*) *buoliana* **Schiff., sobre** *Pinus insignis* **Douglas.** [*E. buoliana* on *P. insignis*.]—*Publ. Inst. Biol. apl.* **5** (1948) pp. 113–121, 9 pls., 4 figs., 11 refs. Barcelona, 1949. (With a Summary in English.)

*Pinus radiata* (*insignis*) was introduced into Spain in the mid-nineteenth century and grows well there but shows poor resistance to insect pests. In

1947–48, observations were made on *Rhyacionia* (*Evetria*) *buoliana* (Schiff.) attacking it near Barcelona. All stages are briefly described. The adults were observed in the field from early June until the end of July, and eggs were laid from mid-June, singly on the lateral and terminal shoots, preferably on young trees. The larvae, which hatched in a few days, entered the shoots and overwintered in them, and feeding was resumed in spring. The larval and pupal stages lasted 9–10 months and 20–30 days, respectively. Other species of *Pinus* were not attacked. In insectary studies, the Ichneumonid, *Pimpla turionellae* (L.) (*examinator* F.) parasitised 60 per cent. of the larvae.

Aldama (R.) & Camps (J. M.). **Estudios de inmunización del papel contra la acción destructora de los insectos.** [Studies on the Protection of Paper from the destructive Action of Insects.]—*Publ. Inst. Biol. apl.* **5** (1948) pp. 123–133, 2 figs. Barcelona, 1949. (With a Summary in English.)

An account is given of investigations in Spain on the possibility of incorporating insecticides into paper during manufacture, to render it immune from attack by insects, principally *Lepisma saccharina* L. The main results of the numerous tests are shown on a graph, from which it appears that about 10 per cent. barium fluoride or barium fluosilicate in the finished paper gave complete or almost complete protection against *Lepisma*. Calcium fluoride was less effective.

Bradley (R. H. E.). **Methods of recording Aphid (Homoptera : Aphididae) Populations on Potatoes and the Distribution of Species on the Plant.**—*Canad. Ent.* **84** no. 4 pp. 93–102, 9 graphs, 24 refs. Ottawa, 1952.

In a comparative study in New Brunswick in 1949 of methods of evaluating populations of Aphids on potato, weekly counts on plants of five varieties were made from July until the beginning of September. The species present were *Macrosiphum solanifolii* (Ashm.), which was the most abundant until towards the end of July, *Myzus persicae* (Sulz.), which then became equally numerous, and *Aphis rhamni* Boy. (*abbreviata* Patch). It was found that estimates of population as numbers per 100 leaves, based on equal numbers of leaves taken from the top, middle and bottom of the plant, may prove misleading in comparisons involving different varieties of potato or potato plants grown under different condition [*cf. R.A.E.*, A **37** 413], owing to differences in the distribution of the Aphid species on the plants and in plant and leaf size ; the total leaf area in a 100-leaf sample from one of the varieties used was double that from another. Where there are differences in the leaf area and number of leaves per plant, Aphid populations are best expressed as numbers per plant, though differences in the numbers per 100 leaves due to leaf size can be eliminated by expressing the population on comparable plants as numbers per unit leaf area.

An investigation of the distribution of the Aphids on four of the varieties on the basis of numbers per unit leaf area showed marked varietal differences in infestation. In general, *M. persicae* and *A. rhamni* were most numerous on the bottom leaves and least numerous on the top ones, whereas *Macrosiphum solanifolii* was most numerous on the top leaves, with little difference between middle and bottom leaves. These differences in distribution, as well as those in infestation of the different varieties, may be due to variations in the microclimate at different foliage levels. *M. solanifolii* was abundant on the top leaves in the mornings, which were cool, and less so in the afternoons, which were hot and dry [*cf.* **33** 34]; this movement may be of importance in the spread of virus diseases. Total Aphid populations per unit leaf area were greatest on the bottom leaves.

Glendenning (R.). *Psila nigricornis* **Meig. (Diptera : Psilidae), a new Pest of possible economic Importance.**—*Canad. Ent.* **84** no. 4 p. 107. Ottawa, 1952.

Dipterous larvae observed mining in the roots, crowns and young shoots of chrysanthemums from a nursery in British Columbia in February 1951 gave rise in March to adults that were identified as *Psila nigricornis* Mg. This is the first record of this Psilid from North America. Notes on its status as a pest of chrysanthemum in England [*cf. R.A.E.*, A **21** 557] are included, with characters for separating it from *P. rosae* (F.).

Perron (J. P.) & Lafrance (J.). **A Note on a Dipterous Predator of the Onion Maggot, *Hylemya antiqua* (Meig.).**—*Canad. Ent.* **84** no. 4 p. 112, 1 ref. Ottawa, 1952.

*Coenosia tigrina* (F.) was observed preying on adults of *Hylemyia antiqua* (Mg.) in rearing cages in Quebec in 1951, a few examples destroying a colony of nearly 300 of these Anthomyiids in two weeks.

Smith (D. S.), Handford (R. H.) & Chefurka (W.). **Some Effects of various Food Plants on *Melanoplus mexicanus mexicanus* (Sauss.) (Orthoptera : Acrididae).**—*Canad. Ent.* **84** no. 4 pp. 113–117, 11 refs. Ottawa, 1952.

The effects of various food-plants on the survival and fecundity of *Melanoplus mexicanus mexicanus* (Sauss.) were investigated in Manitoba in 1944–46, and an account is given of the results obtained in the last two years. Groups of grasshoppers were reared in cages in the open on dandelion [*Taraxacum officinale*], lucerne, flax, oats, wheat, barley, brome grass [*Bromus*], Russian thistle [*Salsola*] and sweet clover [*Melilotus*] over three successive generations, and the numbers of adults on each food-plant were adjusted in each generation so that there were about equal numbers of males and females in each cage. Survival to the adult stage, rate of development and the number of eggs laid all varied with the food-plant ; most nymphs (an average of 65 per cent.) completed their development on dandelion, nymphal development was most rapid (occupying an average of 45·5 days) on flax and wheat, and most eggs per female (an average of 116·9) were laid on wheat. Survival was low on both oats and lucerne, and in 1945, heavy mortality occurred among nymphs fed on Russian thistle when temperatures reached about 110°F. Development was slowest on lucerne in both years, and the differences observed in the rate of development were probably significant only for that plant. Very few eggs were laid on Russian thistle. When the product of the average number of eggs laid per female and the average percentage survival on each food-plant was taken as an index of suitability, wheat, barley and dandelion were the most favourable food-plants and Russian thistle and lucerne the least. The unsuitability of Russian thistle, especially as regards egg-production, is of significance in the western prairies, where this plant sometimes affords the major supply of food.

Morgan (G. T.) & Maxwell (C. W.). *Chlamisus* **sp. (Coleoptera : Chrysomelidae), a new Pest of Strawberries.**—*Canad. Ent.* **84** no. 4 pp. 123–124, 5 refs. Ottawa, 1952.

Larvae of a Cryptocephalid subsequently identified as an undescribed species of *Chlamisus* Raf. (*Chlamys* Knoch, *Arthrochlamys* Iher.) were observed on strawberry in several districts in New Brunswick in 1949–51. In one area, an average of five larvae per plant occurred in the last year, and damage to the

foliage and fruits was so great that the plantations were ploughed under. No other food-plants were found, and in plantations in which the standard strawberry variety and another were grown, the former was the more heavily attacked. Adults first appeared in the field in late May, and the larvae, which bear cases composed of excreta, were present from about mid-June until the end of July ; they fed on the aerial parts of the plant, especially the leaves, which were sometimes skeletonised. Infestation was fairly evenly distributed within the plantations, but the pupae occurred in clusters of up to four on the crowns of the plants. They gave rise to adults at about mid-August, and these fed on the leaves until late September. The larva and adult are briefly described.

HANDFORD (R. H.) & PUTNAM (L. G.). **Efficiency of Grasshopper Baits in Relation to Time of Day of Application.**—*Canad. Ent.* **84** no. 5 pp. 147–155, 7 refs. Ottawa, 1952.

Between 1930 and 1942, recommendations for the control of grasshoppers in Canada emphasised the desirability of applying poison bait in the morning as soon as the air temperature reached about 68°F., which is the temperature at which *Melanoplus mexicanus mexicanus* (Sauss.) and *Camnula pellucida* (Scud.) begin active feeding. Before 1930, however, bait was applied in the early morning without regard to temperature, and even during 1930–42 many reports of successful control by this method were received. The relation of temperature to the effectiveness of baits was investigated under various conditions of vegetation and weather at two places in Saskatchewan in 1942 and 1943 and one in Alberta in 1944. *M. m. mexicanus* in the late nymphal and early adult stages was the main species, but *M. packardii* Scud. and small numbers of *M. bivittatus* (Say) and *C. pellucida* were also present. The bait used in 1942 consisted of about 4 quarts sawdust, about 12 fl. oz. second-grade flour, 0·8 fl. oz. sodium arsenite and 32 fl. oz. water ; the amount of flour was halved in 1943 and 1944 and 63·3 gm. sodium fluosilicate was substituted for the sodium arsenite in 1944. The grasshoppers were allowed to feed on the baits for 1·5–3 hours and were then collected for observations of mortality. Applications were made in the early morning while temperatures were low, somewhat later when shade temperatures first reached 68°F., at various times during the afternoon, and, in 1942 and 1943, in the late evening, and gave average mortalities of 53, 48·5, 43·3 and 54·8 per cent., respectively. The early morning applications were significantly superior to applications at 68°F. at the 7 per cent. level, and both were significantly superior to afternoon applications at the 5 per cent. level. Under warm, sunny conditions, baits applied in the early morning and probably also baits applied in the evening are likely to be at least as satisfactory as those applied at 68°F. Some evidence was obtained that mortality varied inversely with the density of the vegetation and, at least on hot days, with the temperature at the soil surface. As a result of the work, the recommendation that baits should not be applied until the temperature reaches 68°F. was withdrawn.

NEWCOMER (E. J.). **Orchard Insects of the Pacific Northwest and their Control.**—*Circ. U.S. Dep. Agric.* no. 270 (revd), 63 pp., 70 figs. Washington, D.C., 1950.

This edition of a circular on the principal insects and mites that attack fruit and nut trees in Oregon, Washington, Idaho and western Montana resembles the earlier ones [*R.A.E.*, A **22** 29 ; **32** 435] in general scope and arrangement, but the subject matter, notably that on control, has been brought up to date

and extended to include some additional pests, and much of the text has been rewritten. Many of the pests dealt with also occur in Utah and California. The section on insecticides contains notes on the uses of the more important materials in sprays and dusts, the application of sprays by air-blast equipment and the requirements for the effective application of dusts. Other methods of artificial control have been omitted.

ESSIG (E. O.) & ABERNATHY (F.). **The Aphid Genus *Periphyllus*. A systematic, biological, & ecological Study.**—$8\frac{3}{4} \times 5\frac{1}{2}$ ins., ix+166 pp., frontis., 43 figs., 16 pp. refs. Berkeley, Cal., Univ. Cal. Pr., 1952. Price $3.

This account of the Aphids of the genus *Periphyllus* consists of an introductory chapter containing a review of the nomenclature of the genus and general information on the food-plants and life-cycle of its members and ten other chapters each devoted to one of the known species. The life-cycle presents several unusual features, including hibernation in the egg stage regardless of temperature, and the production of a dimorphic stage that persists in the first instar throughout the summer, as well as normal individuals [*R.A.E.*, A **4** 338]. The chapters on the separate species include lists of published records, information on the characters of the different stages and types of individuals, nomenclature, distribution and food-plants and, for several, a more detailed account of the life-cycle. All attack maple (*Acer*), and some that infest ornamental species are carried throughout the world with these plants. The species stated to be injurious in the United States are *P. lyropictus* (Kessler), which attacks several species of *Acer*, notably *A. platanoides*, but not *A. negundo*, and *P. negundinis* (Thos.), which is restricted to the pistillate trees of *A. negundo*. *P. palmerae* Knowlton [**36** 388] is considered to be a synonym of *P. americanus* (Baker).

HALL (I. M.). **Observations on *Perezia pyraustae* Paillot, a microsporidian Parasite of the European Corn Borer.**—*J. Parasit.* **38** no. 1 pp. 48–52, 28 figs., 11 refs. Lancaster, Pa., 1952.

Diseased larvae of *Pyrausta nubilalis* (Hb.) received in California from Iowa during 1950 were found to contain several pathogens, including Microsporidia [*R.A.E.*, A **40** 169]. Since *P. nubilalis* does not occur in California, a laboratory culture of the Microsporidia was established on larvae of *Junonia coenia* Hb. The Malpighian tubules were the principal organs affected. The life-cycle was found to vary only in minor respects from that described for *Perezia pyraustae* in *Pyrausta nubilalis* in France [**15** 655], and it is considered that the organism found and *Perezia pyraustae* represent the same or varieties of the same species. If this is so, this would be the first certain record of *P. pyraustae* from the United States.

PEPPER (J. H.) & HASTINGS (E.). **The Effects of Solar Radiation on Grasshopper Temperatures and Activities.**—*Ecology* **33** no. 1 pp. 96–103, 8 refs. Lancaster, Pa., 1952.

The following is substantially the authors' summary. Studies were made in Montana to determine and compare the effects of direct solar radiation on the body temperatures of *Melanoplus bivittatus* (Say), *M. mexicanus* (Sauss.) and the two colour forms of *M. differentialis* (Thos.). A non-reflecting light cone of the kind used in radiation research was employed to obtain the data. In order to evaluate the latter, it was necessary to investigate possible additive or interfering effects, including the temperature gradients across the bodies of

the grasshoppers, heat losses through evaporation of body moisture, metabolic heat, and conduction and convection of effects. Under the conditions of the experiments, most of these factors were shown to have little, if any influence on body temperatures [*R.A.E.*, A **41** 18]. The rise in body temperature per gm. cal. per sq. cm. per minute of radiation was found to vary with the air temperature and light intensity. A difference between species in their temperature response when exposed to direct solar radiation was also demonstrated. Body temperatures were also determined in grasshoppers in their natural habitats. In all cases, the temperatures of the insects were above those of the surrounding air. This increase in body temperatures over that of the air, from 0·5 to 11°C. [0·9 to 19·8°F.], could be accounted for by the action of direct solar radiation. Certain behaviour patterns could also be ascribed to a temperature response brought about by this same source of energy. The actual increase in body temperature over that of air brought about by the action of the sun's rays was found to be as much as 12°C. [21·6°F.] under conditions of low air temperature and high light intensities. No appreciable differences in temperature response to solar radiation could be ascertained between the two forms of *M. differentialis*.

TINKER (M. E.). **The seasonal Behavior and Ecology of the Boxelder Bug *Leptocoris trivittatus* in Minnesota.**—*Ecology* **33** no. 3 pp. 407–414, 4 figs., 8 refs. Lancaster, Pa., 1952.

The following is based on the author's summary. The seasonal behaviour and ecology of *Leptocoris trivittatus* (Say), which attacks boxelder (*Acer negundo*) and constitutes a nuisance by congregating on buildings for hibernation in autumn [*R.A.E.*, A **38** 376], were studied in Minnesota during the summer of 1950, when general observations in an area that had been heavily infested in 1949 were supplemented by field measurements and laboratory tests. Boxelder seeds were found to be the commonest food of the bugs, and this accounts for their occurrence in numbers only on pistillate trees [*cf.* **16** 522 ; **23** 731] and their observed seasonal change of habitat. During early summer, before the seeds had begun to develop on the trees, they were found only on the ground, where they fed on low vegetation and old seeds. When seed formation began, they moved into the pistillate trees. They were not distributed at random, but occurred in areas of concentration determined by food and temperature. On the ground, they were always near pistillate trees, where seeds could be found. The concentration areas on the ground and the trees infested were both sunlit for all or most of the day ; ground concentrations were on substrata with high heat-absorbing capacities, and the tree infestations were on the sunny side of the trees. In the laboratory, the threshold for activity was found to be about 20°C. [68°F.]. This shows some agreement with the temperatures at which the spring and autumn migrations took place, as the temperature on all the days on which flight was observed was near 20°C. Since the largest autumn migration took place after a period of freezing weather, low temperature may stimulate flight and the search for hibernation sites.

A study of the instar composition of the autumn population showed that the second generation was not complete in 1950, and this may be an important factor in natural control. Almost all the bugs that congregated on buildings were adults, and mortality among those that had not migrated to buildings was very high. The need for high temperatures and a long growing season for the production of a second generation was demonstrated by temperature summations, made with 20°C. as the threshold, for years with low and high populations ; low values were found to be associated with low populations and high values with large ones.

Shands (W. A.), Simpson (G. W.), Lombard (P. M.), Cobb (R. M.) & Lung (P. H.). **Control of Aphids on Potatoes with DDT when used with Fungicides.**—*Bull. Me agric. Exp. Sta.* no. 480, 41 pp., 11 figs., 5 refs. Orono, Me., 1950.

The following is based on the authors' introduction and summary. Since DDT showed promise in 1944–45 for the control of the Aphids, *Myzus persicae* (Sulz.), *Aphis rhamni* Boy. (*abbreviata* Patch), *Macrosiphum solanifolii* (Ashm.) and *M. solani* (Kalt.) (*Myzus convolvuli* (Kalt.) on potato in Maine [*cf. R.A.E.*, A **35** 253], further tests were carried out in 1946–48 on the effect of DDT in combination with fungicides. Spray mixtures were applied to small replicated plots of potato with a power sprayer, designed to provide more thorough plant coverage than usual, at 125 U.S. gals. per acre and a pressure of 100–120 lb. per sq. in.

In 1946, sprays of bordeaux mixture (10 : 5 : 100) and of 5 lb. tribasic copper sulphate per 100 U.S. gals. were applied 13 times, alone or with the addition of 2 lb. technical DDT in a wettable powder or 0·5 lb. in an emulsion concentrate. None of the treatments injured the plants. There were much larger populations of apterae of *A. rhamni* on plants treated with tribasic copper sulphate only than on those treated with bordeaux mixture only, and the effect of the fungicides on the Aphid population tended to obscure any differences in the insecticidal properties of the sprays containing DDT. Of these, the emulsion gave rather better Aphid control than the suspension early in the season, but was the less effective later. All DDT treatments increased yields. The emulsion with bordeaux mixture caused the smallest increase, owing to a depressing effect of the latter on plant growth, and there were no significant differences in increase among the other three treatments. The inexact correlation between yields and Aphid control may have been due largely to differences in the yield-depressing effects of the fungicides. In a further experiment, treatment with 0·75 lb. DDT (in a wettable powder) per 100 U.S. gals., with bordeaux mixture, bordeaux mixture with a wetting and spreading agent, tribasic copper sulphate or nabam (disodium ethylene bisdithiocarbamate), ten times at weekly intervals caused no visible injury to the growing plants. There were no significant differences between treatments in Aphid control until the end of July, after which DDT in bordeaux mixture was the most and DDT in nabam the least effective against apterae of *A. rhamni*. The mixture of DDT and bordeaux mixture tended to be less effective with the spreader than without it, though the difference was not significant. Any effect of the fungicides on the insecticidal properties of DDT were probably obscured by their direct effects on Aphid populations. In general, satisfactory commercial control was not obtained with DDT at the low concentration used and there were no differences in yield between treatments. In a test on the effect of concentration of emulsifying agent on the effectiveness of DDT, ten weekly applications were made of sprays of 0·5 lb. DDT in 450 ml. alkylated naphthalene with 22·5 or 126·2 ml. alkyl aryl polyether alcohol per 100 U.S. gals. in bordeaux mixture or of the same two emulsions in water with 2 U.S. quarts nabam or 5 lb. tribasic copper sulphate, respectively. None of the treatments injured the plants. Increasing the concentration of emulsifying agent above the normal improved the control of wingless Aphids but reduced the toxicity of the residues to alates of *Myzus persicae*. There was no difference in tuber yields.

The tests in 1947 and 1948 concerned the effects of solvents used in making DDT emulsion concentrates on the plants and on the toxicity of the DDT in spray mixtures containing yellow cuprous oxide. A spray containing wettable DDT was also tested, and 12 applications were made in 1947 and 13 in 1948. All treatments gave satisfactory commercial control of the Aphids without visible injury to the plants. Differences in the degree of control of *A. rhamni*, *Macrosiphum solani* and *M. solanifolii* were of no commercial importance, and

differences in control in the two years or in the same season were inconsistent. Treatments did not improve the total yield, but affected tuber weight and size in 1948.

FRANCO DO AMARAL (S.). **A cultura do arroz e os " gorgulhos aquáticos " no Estado de São Paulo.** [The Cultivation of Rice and " Water Weevils " in the State of São Paulo.]—*Biológico* **16** no. 4 pp. 73–82, 6 figs., 6 refs. São Paulo, 1950.

Considerable damage is done to irrigated rice in São Paulo by water weevils. The species present are *Lissorhoptrus foveolatus* Duval [*cf. R.A.E.*, A **36** 8], *Hydrotimetes* sp. and *Neobagous* sp., and they are particularly injurious to rice grown in seed-beds and transplanted. They did not occur on field-sown rice examined in 1948–49. The weevils are carried to the seed-beds with the irrigation water and apparently find favourable conditions there, so that the seedlings are already infested by eggs, larvae and adults when they are transplanted. The infestation persists in the fields, but counts in 1947–49 showed that whereas the three species formed 16·3, 33 and 50·6 per cent., respectively, of the population in the seed-beds, they constituted 11·1, 81·4 and 7·3 per cent. of that in the fields. Although *Neobagous* was the most numerous in the seed-beds, *Hydrotimetes* caused the most damage in laboratory tests. The adults feed on the leaves, and the females oviposit on the plants, those of *Hydrotimetes* preferring the stems. The larvae, which cause most of the damage, feed in the stems for a time and then migrate to the roots, where they complete their development and pupate. Heavy attacks result in the destruction of the plants.

In tests on control, adults of the three species were placed in glass tubes containing rice seedlings immersed to one-third of their height in emulsions prepared from concentrates of parathion, DDT or BHC. The BHC proved the most effective, giving complete mortality of all three species in 48 hours at a concentration of 1 : 800,000 and killing 100 per cent. of *Neobagous* and *Hydrotimetes* and 90 per cent. of *L. foveolatus* in the same period at half the strength. Dusts of 0·5 and 2 per cent. γ BHC gave 20 and 36·7 per cent. mortality, respectively, of the adults of *L. foveolatus* and 83·6 and 90 per cent. of those of *Hydrotimetes* in 48 hours without damage to the plants.

GRIOT (M.). **Los enemigos naturales del pulgón verde de los cereales y las posibilidades de su aplicación.** [Natural Enemies of *Toxoptera graminum* and the Possibilities of their Application.]—*Publ. Inst. Sanid. veg.*] *Minist. Agric. Argent.* (A) **5** no. 48, 29 pp., 145 refs. Buenos Aires, 1949.

In this paper, which is based largely on the literature, the distribution of *Toxoptera* (*Schizaphis*) *graminum* (Rond.) is reviewed, and it is stated that in Argentina, where it first caused serious damage in 1937 [*cf. R.A.E.*, A **26** 289, etc.], it is injurious in autumn, winter and spring, is favoured by dry, cool conditions [*cf.* **33** 310], and develops to outbreak numbers simultaneously in the different infested areas. Estimates of the losses of wheat, oats, barley and rye caused by it in various Provinces during 1944–45 are shown in tables. Lists are given of its insect parasites and predators in Argentina [**29** 36 ; **32** 99], the United States [**15** 438 ; **29** 251 ; **32** 399], the Soviet Union [**19** 107] and South Africa [**2** 154], and observations on the control afforded by *Aphidius* (*Lysiphlebus*) *testaceipes* (Cress.) in the United States [*cf* **29** 251 ; **32** 399] and *A. platensis* Brèth. in Argentina are reviewed. *A. platensis* occurs in all the areas in Argentina infested by the Aphid and has also been distributed artificially though apparently with little effect [*cf.* **33** 311]. Its alternative hosts [**26** 290] and bionomics [**33** 311] are discussed, and it is concluded that large-scale liberations of this parasite would be useless, and that

probably little would be gained by the introduction of exotic species, since parasites of similar habits already occur in Argentina.

Torres (B. A.). **Insectos perjudiciales y útiles al cultivo de la papa en la Argentina.** [Noxious and useful Insects in the Cultivation of Potato in Argentina.]—[*Publ. Inst. Sanid. veg.*] *Minist. Agric. Argent.* (B) **6** no. 17, 37 pp., 44 figs., 46 refs. Buenos Aires, 1950. (With a Summary in English.)

The author gives a list of the harmful and beneficial insects found on potato in the course of surveys in various parts of Argentina, with locality records and very brief notes on the appearance and bionomics of the more important. Most of the insects are injurious, and the others predacious or parasitic on injurious species.

Pastrana (J. A.) & Gahan (H.). **Cría en masa de *Macrocentrus ancylivorus* Roh. parásito natural del "gusano del duraznero" en la República Argentina.** [The Mass Breeding of *M. ancylivorus*, a natural Parasite of *Cydia molesta* in Argentina.]—[*Publ. Inst. Sanid. veg.*] *Minist. Agric. Argent.* (B) **6** no. 19, 22 pp., 12 figs., 31 refs. Buenos Aires, 1950.

The breeding of *Macrocentrus ancylivorus* Rohw. on a large scale on *Gnorimoschema operculella* (Zell.) for release against *Cydia* (*Grapholitha*) *molesta* (Busck) on peach in Argentina was begun in 1946. The method of rearing, which was a modification of that evolved in the United States [*R.A.E.*, A **39** 279, etc.], is described in detail. Production in the early months was limited by a bacterial infection, and the percentage parasitism in the cages at no time exceeded about 50.

Prentice (I. W.). **Resolution of Strawberry Virus Complexes. V. Experiments with Viruses 4 and 5.**—*Ann. appl. Biol.* **39** no. 4 pp. 487–494, 11 refs. London, 1952.

In addition to strawberry viruses 1, 2 and 3, which were described in earlier parts of this series [*R.A.E.*, A **39** 426, etc.], two other viruses that infect strawberry have been isolated. They are referred to as viruses 4 and 5. Virus 4, for which the descriptive name strawberry vein-chlorosis virus is proposed, causes vein chlorosis and necrosis on cultivated strawberry of the variety Royal Sovereign and slight chlorotic spotting on wild strawberry (*Fragaria vesca*) and is common in the field in Britain. Attempts to transmit it by means of *Capitophorus* (*Pentatrichopus*) *fragaefolii* (Ckll.) (*fragariae* (Theo.)) were unsuccessful, though some indications of transmission by that Aphid had been obtained in earlier tests with yellow edge [**37** 326]. Virus 5, for which the name strawberry leaf-curl virus is proposed, caused leaf curling and vein necrosis on Royal Sovereign and wild strawberry in glasshouse tests and was transmitted by examples of *C. fragaefolii* that had fed for at least one hour on an infected plant ; it persisted in the vector for about an hour. It was first observed in wild strawberry to which Aphids had been transferred from an apparently symptomless plant of an American variety, and is not known to occur in the field in Britain.

The author considers that the earlier assumption that strawberry virus 1 [**37** 326] is identical with mild crinkle virus [*cf.* **35** 207] is invalid, and proposes the name strawberry mottle for it ; he also proposes the name strawberry crinkle virus for virus 3 [**37** 483]. Mottle virus is common in cultivated varieties of strawberry in England, but the symptoms are generally too slight for diagnosis. Mild crinkle is commonly caused by the vein chlorosis virus alone or with mottle virus ; severe crinkle is caused by the crinkle virus alone or with the viruses of vein chlorosis and mottle either separately or in combination, and yellow

edge by the mild yellow-edge virus in combination with the mottle or crinkle virus [see also **37** 484]. The symptoms produced by the five viruses on Royal Sovereign and wild strawberry are shown in a table, and data on the vector relations of those transmitted by *C. fragaefolii* are briefly discussed.

CADMAN (C. H.). **Studies in *Rubus* Virus Diseases. IV. Yellows Diseases of Raspberries.**—*Ann. appl. Biol.* **39** no. 4 pp. 495–500, 1 pl., 6 refs. London, 1952. **V. Experiments in the Analysis of Lloyd George Decline.**—*T.c.* pp. 501–508, 1 pl., 10 refs.

The following is the author's summary of the first of these two papers, which form parts of a series on investigations in Scotland on virus diseases of raspberry [*cf. R.A.E.*, A **40** 143, 186, 187]. Yellows diseases of raspberry, previously considered to be physiological disorders, have causes, presumably viruses, that are transmitted by grafting. Several can be distinguished by the severity of symptoms produced in different raspberry varieties, but whether they are caused by distinct viruses or by related strains is uncertain. Two, called mild and severe yellows, are thought not to be related to the yellow mosaic and yellows virus described in North America.

The following is almost entirely the summary of the second paper. Degenerate plants of the raspberry variety Lloyd George are usually infected with a complex of viruses that produces the diseases known as mild and severe mosaic 2 [**38** 470–471] on Baumforth's Seedling B and Norfolk Giant. This complex is shown to comprise mild yellows and at least two other viruses, one of which, here designated raspberry leaf-spot virus, was transmitted in experiments by *Amphorophora rubi* (Kalt.), after feeding for 13 hours or more on infected plants, but not by *Aphis* (*Doralis*) *idaei* v.d.Goot. This virus produces characteristic symptoms on Baumforth's Seedling B, Burnetholm Seedling and Norfolk Giant, and it is carried without symptoms by St. Walfried, Lloyd George and many other European and North American varieties. Both mild yellows and leaf-spot viruses seem to be only subsidiary causes of raspberry degeneration.

BROADBENT (L.), GREGORY (P. H.) & TINSLEY (T. W.). **The Influence of Planting Date and Manuring on the Incidence of Virus Diseases in Potato Crops.**—*Ann. appl. Biol.* **39** no. 4 pp. 509–524, 1 graph, 17 refs. London, 1952.

The following is virtually the authors' summary. Field experiments with Majestic potatoes were made over six years at Rothamsted to test the effects of varying date of planting and manuring on the yield of tubers and the incidence of the Aphid-transmitted leaf roll and Y (rugose mosaic) viruses. Yield was increased by early planting and by all the manures, especially dung. Early planting also usually increased the incidence of virus disease. Different manures had different effects on disease incidence ; the average results from all comparisons showed the largest increase in incidence of both viruses from the use of dung ; ammonium sulphate increased the incidence of leaf roll, and potassium chloride that of rugose mosaic. Counts in two years showed that Aphid populations were highest on the earlier planted potatoes, and were increased by dung, ammonium sulphate and superphosphate, but were reduced by potassium chloride.

JOHNSON (C. G.). **The changing Numbers of *Aphis fabae* Scop., flying at Crop Level, in Relation to current Weather and to the Population on the Crop.**—*Ann. appl. Biol.* **39** no. 4 pp. 525–547, 7 graphs, 14 refs. London, 1952.

Changes in the numbers of Aphids in flight from month to month in summer are known to represent population fluctuations, but changes in the daily numbers

are in general assumed to be regulated by weather conditions. No critical work has been done on the causes of these fluctuations, however, and they were accordingly investigated in southern England during 1949. Alates of *Aphis fabae* Scop. were collected in two traps that segregated the catch into hourly samples [*R.A.E.*, A **38** 296]. These were operated continuously throughout the infestation period of 5–6 weeks. One was situated in a sheltered plot of broad beans and the other in an exposed position in a potato plot between sugar-beet and broad beans, both of which were heavily infested ; it was found necessary to correct the results obtained with the second trap for wind speed, and the correction factors employed are given. The numbers of Aphids trapped each hour were correlated with meteorological data recorded close to the first trap and ¼ mile away from the second.

The following is almost entirely the author's summary of the results. Alates of *A. fabae* flying over bean crops usually showed a double peak of aerial density during the day ; scarcely any flight occurred at night. The first peak is thought to be due mainly to alates that have emerged since the previous evening and the decline of the peak to their depletion as they fly away from the crop. The second peak is probably due to alates that moult on the day of flight. Lack of flight at night is caused by low temperature and lack of alates old enough to fly, and probably also by low light intensity.

Changes in aerial density from hour to hour were only very weakly correlated with weather factors, especially wind speed. The total numbers in each of the two peaks showed a low but significant correlation with both wind speed and temperature in one case, but even then only a relatively small amount of the variation in aerial numbers was associated with weather changes. Other factors, particularly rapid changes in the numbers of alates on the crop caused by moulting, accumulation before flight and depletion by flight, evidently obscure changes due simply to varying flight behaviour. Thus, because of large populations in the crop, it is possible for quite large numbers to be in the air even when the weather is relatively unfavourable for flight.

The relation between the total numbers caught at different wind speeds showed that most of the migration occurred in winds so strong that the Aphids could have had no control over the general direction of flight. The current view that most migration takes place only in calm weather can therefore no longer be held.

ARMSTRONG (G.), BRADBURY (F. R.) & BRITTON (H. G.). **The Penetration of the Insect Cuticle by DDT and related Compounds.**—*Ann. appl. Biol.* **39** no. 4 pp. 548–556, 2 graphs, 12 refs. London, 1952.

Following work on the penetration of insect cuticle by isomers of BHC using a micro-colorimetric technique [*R.A.E.*, A **40** 37], similar investigations were carried out with p,p′DDT, p,p′DDE (1,1-di(p-chlorophenyl)-2,2-dichloro-ethylene) and their o,p′ isomers ; the last three of these compounds are either not toxic to insects or only slightly so. Adults of *Calandra granaria* (L.) were exposed for periods varying from a few hours to several days on pieces of filter paper impregnated with the compounds at approximately 110 mmg. per sq. cm. The amount of each compound recovered by washing the insects in cold methanol was considered as being outside the insects [*cf. loc. cit.*] and that recovered by subsequent grinding with anhydrous sodium sulphate and extracting with ether as being inside.

Penetration was much slower for p,p′DDT than it had been for γ BHC, the maximum amounts taken up outside and inside the insect being, respectively, 60 mmg. per gm. insect in 3–4 days and 40 mmg. per gm. insect in 6 days, whereas corresponding amounts of γBHC were in each case picked up in 12 hours. In contrast with the previous results, the three less active compounds all penetrated

more rapidly than the active one. No relation was found between the amount of the compounds taken up outside the insect and their solubility in light spray oil ; on the basis of their relative solubilities in oil, only p,p′DDT would be able to reach saturation in the wax of the epicuticle. The more rapid penetration of γ BHC as compared with p,p′DDT is attributed to its higher vapour pressure.

PEACE (T. R.). **Poplars.**—*Bull. For. Comm.* no. 19, iv+50 pp., 24 pls., 74 refs. London, H.M.S.O., 1952.

This bulletin includes a section (pp. 30–39) on the insects that attack poplar in Britain, in which notes are given on morphology, bionomics and control and on the nature of the damage caused.

SUBBA RAO (N. V.) & POLLARD (A. G.). **Photo-decomposition of Rotenone in Spray Deposits. I. Colorimetric Determination of Rotenone in Spray Deposits and Residues.**—*J. Sci. Fd Agric.* **1** no. 12 pp. 367–371, 1 fig., 17 refs. London, 1950. **II. Laboratory Technique for producing Replicate Deposits.**—*Op. cit.* **2** no. 4 pp. 176–180, 1 fig., 17 refs. 1951. **III. Kinetics of the Photo-decomposition.**—*T.c.* no. 10 pp. 462–472, 4 figs., 24 refs.

The following are virtually the authors' summaries of the first two parts. The Goodhue method is adapted to estimate rotenone in concentrations varying between 0·01 and 0·10 mg. per cc. The influence of spray auxiliaries and of dehydrorotenone, the primary decomposition product of rotenone [*R.A.E.*, A **39** 207], was investigated, and a method for determination of rotenone in the presence of dehydrorotenone was developed for application to the examination of spray deposits and residues.

A satisfactory method for producing replicate deposits in the laboratory was evolved by the use of a modified Potter tower [**29** 591] and an aerograph nozzle. Various factors affecting deposition were studied.

The following is based on the summary of the third part and the discussion of the results reported in it. Special artificial light sources were designed and constructed to investigate the photo-decomposition of rotenone under controlled conditions. The various factors that affect the decomposition were investigated and the rates of decomposition of rotenone and derris deposits on exposure to sunlight and the artificial light sources determined. One of the artificial light sources decomposed rotenone deposits more readily than sunlight. It gave a strong emission of light with a wave-length of 3,650 Ångström units ; it is tentatively concluded that light with wave-lengths falling between 3,000 and 4,000 units is mainly responsible for decomposition and that light with a wave-length exceeding 5,000 units does not cause any. In both sunlight and artificial light, thin deposits were more readily decomposed than thick ones. The rate of decomposition of rotenone and derris deposits was found to bear a logarithmic relation to the quantity of light energy. This decrease in the rate of decomposition with increase in light energy may be due either to decrease in the concentration of the reactants or, more probably, to the prevention of the absorption of light of shorter wave-length by the accumulated dehydrorotenone. Data from experiments in sunlight indicated that a pure rotenone deposit loses almost all its toxicity in 5–6 average spring days (total daylight illumination of 25,000 foot-candle-hours) or in 2–3 summer days (total daylight illumination of 50,000 foot-candle-hours). Deposits thinner than 0·01 mg. per sq. cm. lose their toxicity more rapidly. In the field, however, rotenone and derris resins are normally applied in dusts and sprays with inert diluents, and the rotenone is not directly exposed to sunlight, but is more or less covered by the diluent.

TAYLOR (G. G.). **Spray Treatments for Control of Red Mites in Apple Orchards.**—*N.Z. J. Sci. Tech.* **34** (A) no. 1 pp. 36–46, 2 refs. Wellington, N.Z., 1952.

The control measures commonly applied against *Paratetranychus pilosus* (C. & F.) and *Bryobia praetiosa* Koch on apple in New Zealand comprises a spray of winter oil during the dormant period and two sprays of summer oil in January. The winter oil gives only partial control, and as the summer oil cannot be used before January owing to its incompatibility with fungicidal sprays of sulphur, large populations of mites develop. The problem is further intensified by the use of DDT, which favours heavy mite infestation by destroying predators. Various recently developed acaricides were therefore tested at three places during 1946–50, in an attempt to provide a satisfactory early summer spray. The materials tested were Selocide (a solution containing 4·8 per cent. selenium [as potassium ammonium selonosulphide]), HETP (15–20 per cent. tetraethyl pyrophosphate), 15 per cent. wettable parathion powder, Arathane (25 per cent. wettable dinitrocaprylphenylcrotonate), 50 per cent. wettable BHC powder (6·25 per cent. γ BHC), the dicyclohexylamine salt of dinex as a wettable powder containing 20 per cent. active ingredient and as a solution of unknown concentration ; and a mayonnaise emulsion containing 80 per cent. summer oil ; all spray quantities are given per 100 gals.

There was no marked difference in the susceptibility of the two mites to the sprays. Selocide proved to be the most effective, and though its ovicidal properties were weak, the residues remained toxic to the newly hatched mites for several months. Two applications at 0·5–1 pint made during or shortly after the flowering period controlled mites for most of the growing season, and the slight reinfestation that occurred in the autumn caused negligible foliage injury. A combination of sulphur with Selocide showed a synergistic effect [*cf. R.A.E.*, A **28** 186], but in combination with lead arsenate, Selocide severely damaged the foliage. HETP at 0·5 pint was very toxic to the adults and immature mites, but was not persistent and was of little value against the eggs. Trees bearing large numbers of summer eggs became reinfested particularly quickly, and it is possible that HETP destroys insects that would otherwise prey upon the newly hatched mites. The parathion powder at 0·5 lb., BHC at 0·25 lb. γ isomer and Arathane at 0·75 lb. gave temporary control, but did not prevent reinfestation for more than a few weeks. The dinex salt did not give adequate control in either form, and the wettable powder caused severe foliage injury at 2·5 lb. Summer oil at 1·25 gal. applied from January onwards was as effective as HETP against the adults and immature mites and gave a longer period of protection.

Analyses of fruits harvested in March-April from trees sprayed with Selocide showed that when two applications at 1 pint were made not later than the end of October, selenium residues did not exceed 0·08 part per million of fresh fruit weight. When the sprays were applied not later than the beginning of February, they did not exceed 0·3 p.p.m. ; fruit from unsprayed trees contained up to 0·04 p.p.m. selenium. The maximum amount of selenium in the whole diet that can be consumed without ill effects is believed to be about 3 p.p.m. [**28** 186]. No evidence was obtained of any tendency in trees that had been sprayed with Selocide for three successive years to assimilate increased amounts of selenium from the soil.

TAYLOR (G. G.). **Spray Treatments with Lead Arsenate for Control of Codling Moth (*Cydia pomonella* L.) on Apple Trees.**—*N.Z. J. Sci. Tech.* **34** (A) no. 1 pp. 59–64, 3 refs. Wellington, N.Z., 1952.

Lead arsenate is the principal insecticide used against *Cydia pomonella* (L.) on apple in New Zealand, but it has not given satisfactory control in some

districts, and its lack of success has been attributed to increased resistance of the larvae. Growers have consequently tended to use higher concentrations and make earlier and more frequent applications, but though the risk of spray injury to the foliage has been thereby increased [*cf. R.A.E.*, A **39** 325] and the high mortality to honey bees from early applications has necessitated legislation prohibiting the use of lead arsenate on trees in bloom, there has been no marked improvement in control. Many of the orchards in which lead arsenate fails to give control have large populations of overwintering larvae, which are responsible for the heavy infestation. In tests during 1935–47, lead arsenate applied at the recommended rate of 1·5 lb. per 100 gals. at the usual intervals of 14–18 days from petal-fall failed to give adequate control in an orchard in which overwintering populations were heavy. Increasing the concentration to 4·5 lb. in 1943–44 gave little improvement and increased the injury to the fruit and foliage, but reducing the intervals between the sprays to eight days in 1944–45 significantly reduced damage by *C. pomonella*. Where lead arsenate sprays are efficiently applied, however, overwintering populations are reduced, and under these conditions, the normal lead-arsenate spray programme gave adequate control. Good spray coverage is of major importance in ensuring efficient control, and this is most usually attained in orchards in which the trees are sprayed individually.

There are still many flowers on the trees at the time of the petal-fall application, and in a test in which this spray was omitted, the number of fruits showing superficial injury was increased by only 0·8 per cent. ; the amount of control given by this spray is not considered sufficient to warrant the risk of mortality among bees.

MILLER (L. W.). **Orchard Mite Investigations. Progress Report of Investigation for Season 1948–49.**—30 pp., 2 figs., 8 graphs, 17 refs. [Hobart] Dep. Agric. Tasm., 1949.

The following is based largely on the author's summary. Orchard mites have become important pests of apple in Tasmania, particularly since the introduction of DDT for the control of the codling moth [*Cydia pomonella* (L.)] [*cf. R.A.E.*, A **36** 246]. The species present are *Tetranychus telarius* (L.) (*urticae* Koch), *Bryobia praetiosa* Koch and *Paratetranychus pilosus* (C. & F.). The last is by far the most important ; it has not as yet been observed in any other part of Australia. It is common on apple, pear, plum and hawthorn [*Crataegus*] and has also been recorded as a pest of oak [**28** 442]. Investigations on it were carried out in 1948–49.

In laboratory studies on its bionomics, the egg and larval stages lasted 5–14 and 1–4 days, respectively, and each of the two nymphal stages 0·5–4 days at mean temperatures of about 68–77°F. The females survived for an average of 14·9 days, and the duration of the preoviposition and oviposition periods averaged 1·6 and 13·5 days, respectively. The average number of eggs laid per female was 21·8 and the maximum 49. The ratio of males to females was a little over 1 : 2.

The seasonal cycle of *P. pilosus* and the results of spray treatments were determined from regular counts of the population in an orchard containing a single variety of apple. Mites were observed hatching on 20th September, when the trees were approximately midway between the green-tip and pink-bud stages [*cf.* next abstract]. Populations on unsprayed trees reached their peak in mid-February, resulting in severe damage to the foliage. Counts of overwintering eggs on the wood showed that there was a very heavy carry-over. Fair commercial control was given by a dormant application of 5 per cent. red oil (83 per cent. mineral oil with a viscosity of 153 Saybolt at 100°F., specific gravity 0·919, and 70 per cent. unsulphonatable residue), a spray of

4 per cent. pale oil (a mayonnaise-type emulsion containing 85 per cent. of a similar oil) at the green-tip stage, and an application of 2·5 per cent. pale oil at the green-tip stage followed by one of 2·5 per cent. of a similar emulsion containing 85 per cent. oil with a viscosity of 74, specific gravity 0·889 and an unsulphonatable residue of 85 per cent., at the pink-bud stage. Poor control resulted from either of the 2·5 per cent. oil sprays alone. Since the populations on trees sprayed with oils during the winter tended to increase late in the season, there were large numbers of overwintering eggs on all such trees by autumn. Sprays of 0·0625 per cent. of a preparation containing 95 per cent. HETP (hexaethyl tetraphosphate) or 0·0075 per cent. of one containing 74 per cent. parathion with an emulsifier gave good results as summer acaricides, the latter being apparently the more effective. Two sprays of a summer acaricide used in combination with the first and second cover sprays of DDT against *C. pomonella* gave results that were at least equal to those of the best ovicidal oil treatments. Extremely good control of the mite was obtained where both winter ovicidal treatments and summer acaricides were used, and the numbers of overwintering eggs were greatly reduced. There was extensive foliage injury where oil and lime-sulphur were used in combination at the pink-bud stage. No phytotoxic symptoms were observed from either HETP or parathion. The only insect predacious on *P. pilosus* so far recorded from orchards in Tasmania is the Coccinellid, *Stethorus vagans* (Blkb.). Climatic conditions appear greatly to influence its abundance, and it was hard to find in 1948–49, even in orchards not sprayed with DDT.

MILLER (L. W.). **The Hatching of the overwintering Eggs of the European Red Mite.**—*Tasm. J. Agric.* **23** no. 2 pp. 102–116, 11 figs., 15 refs. Hobart, 1952.

Observations were made on the hatching of the overwintering eggs of *Paratetranychus pilosus* (C. & F.) in an apple orchard in Tasmania in 1949–51. Little evidence was obtained that it was influenced by the position of the eggs on the tree. Hatching on a single variety of apple extended over 64 days in 1949, 50 in 1950 and 51 in 1951, and the percentages that hatched were 86·2, 33·8 and 52·8, respectively. Despite the wide fluctuations in duration, the hatching period tended to be longer than in Europe or the United States [*cf. R.A.E.*, A **36** 374], possibly owing to the milder winter conditions in Tasmania. When hatching was studied on trees of different varieties, there was some evidence that the hatching periods were shorter and the percentages of viable eggs lower on early than on late varieties. Trees of one late variety reached the green-tip, pink-bud and calyx stages of development at about the same date in 1949 and 1950 and one week later in 1951, and hatching began at about the green-tip stage and continued until after the calyx stage in each year ; the rate of hatching varied considerably from year to year, however, and the percentages of eggs that had hatched by the pink-bud and calyx stages varied from 10 in 1951 to nearly 40 in 1949 and from 75 in 1949 to over 98 in 1951, respectively. Lime-sulphur sprays are normally applied at the pink-bud and calyx stages against black spot (*Venturia inaequalis*) and have some effect on the active stages of the mite, though not on the eggs. In 1949, hatching began early but was later retarded by rain, and conditions therefore became unfavourable for the spray deposits. In the other two years, little or no rain fell between the spraying dates. A further factor operating against lime-sulphur sprays in years in which hatching is early and rapid is that some of the mites may reach the adult stage and oviposit before the calyx spray is applied ; in such years, conditions may be more favourable for the oil-emulsion spray applied at the green-tip stage, since oil sprays have been shown to be most effective against eggs on the point of hatching [*cf.* **31** 306 ; **38** 94].

MARTYN (E. J.). **Insecticidal Control of the Corbie *Oncopera intricata* Walker (Lepidoptera Family Hepialidae).**—*Tasm. J. Agric.* **23** no. 3 pp. 200–211, 3 figs., 7 refs. Hobart, 1952.

Lead-arsenate sprays were found effective against *Oncopera intricata* Wlk. in pasture in Tasmania [*R.A.E.*, A **17** 534], but have not been generally adopted owing to the necessity for removing grazing stock from treated pastures for a fortnight, and, until recently, to lack of suitable spraying equipment. In 1949–51, chlorinated-hydrocarbon insecticides were tested on plots on heavy soil in which infestation was low. In 1949, DDT and BHC (13 per cent. γ BHC) as 2 per cent. dusts at rates of 2 lb. p,p′DDT and 0·26 lb. γBHC per acre and in bran baits at 0·5 lb. p,p′DDT or 0·07 lb. γ BHC per acre, and a spray of chlordane at 1 lb. per acre were applied in late August, when the larvae were almost mature and protected by their tunnels and runways. Only the DDT dust gave effective control, as measured by damage ratings, and plots treated with it made satisfactory spring growth, whereas the others were severely injured. In 1950, DDT and BHC were applied at rates of 0·25, 1 or 2 lb. p,p′ DDT and 0·26 lb. γ BHC per acre in superphosphate applied at 1 cwt. per acre in early April, when the larvae were hatching or in loose communities under webs on the surface of the soil, and single applications of the DDT dust at 1 lb. p,p′DDT per acre were made in April or July and of the BHC dust in July. Larval populations were sampled in September or October by a method recently noticed [**40** 357]. The DDT dust applied in April and DDT in superphosphate at the two higher rates all gave very good control, DDT in superphosphate at the lowest rate and BHC in superphosphate gave barely significant control, and the DDT and BHC dusts applied in July were poor. A further application in April 1950 of 2 lb. p,p′DDT to plots that had been treated with this dust in 1949 caused a highly significant reduction in population. Of the materials applied in 1949, the DDT dust showed marked and the DDT bait some toxicity in 1950, and the effects of these materials and of the mixture of superphosphate and DDT at the highest rate were still apparent in October 1951, though they could not be reliably assessed.

On the basis of these results, the incorporation of DDT at 1 or 2 lb. per acre in superphosphate applied as a top-dressing in autumn is recommended for control of the young larvae, but this treatment is largely preventative in nature, since young larvae are sometimes killed by weather conditions. Recent increases in the cost of DDT and of mixtures of it with superphosphate render preventative treatments economically justifiable only on regularly infested areas.

MAY (A. W. S.). **The Grape Scale.**—*Qd agric. J.* **75** pt. 2 pp. 105–107, 1 fig. Brisbane, 1952.

Notes are given on the seasonal history and control of *Eulecanium persicae* (F.), which has in recent years become of importance in vineyards and orchards in an area in south-eastern Queensland, together with a brief description of the damage caused. Grape vines are most commonly infested by this Coccid, but some varieties of plum and pear are also attacked. High populations during the season of 1950–51 were quickly checked by hot, dry weather in the following spring and early summer and by natural enemies. Where control measures are necessary, a thorough application of dormant oil (1 : 20) during July or early August is effective. If spraying is delayed until the vines have been pruned, a semi-dormant oil, applied alone or with lime-sulphur, can be substituted after mid-August, to reduce the risk of plant injury, but it should not be used later than mid-September. Control is difficult in summer, owing to the presence of the leaves and the prolonged hatching period of the eggs, which prevents effective timing. If populations become high, white oil (1 : 40)

can be used, but sulphur fungicides must not be applied for at least three weeks before or after treatment.

[Veitch (R.) & others.] **Insect Pests and Diseases of Plants.**—*Qd agric. pastoral Handb.* **3** 2nd edn., 9½×6 ins., v+560 pp., 311 figs. Brisbane, 1951.

In this second edition of a book on the pests and diseases of economic plants other than sugar-cane in Queensland [*cf. R.A.E.*, A **27** 87], the matter has been greatly extended and brought up to date. General information on insects, fungi and other disease organisms and more detailed accounts of various insecticides and fungicides and their uses are given in two preliminary chapters ; the remaining 15 are devoted to the pests and diseases of specific crops, and contain descriptions of the pests, most of which are insects, and accounts of the life-history, damage and control. The crops considered are fruits of various kinds, to which five chapters are devoted, cereal and oil-seed crops, cotton, tobacco, potato, tomato and other vegetables. There are also chapters dealing with pests of grassland and lucerne and of stored products, and the final one includes sections on pests of seed-beds and gardens, insects that attack timber in houses and farm buildings, and miscellaneous household pests.

Simmonds (H. W.). **Observations on the Biology and natural Control of the Black Scale of** *Citrus*, *Saissetia oleae* **(Bern.), in South Australia.**—*J. Dep. Agric. S. Aust.* **54** no. 7 pp. 339–342, 1 fig., 4 refs. Adelaide, 1951.

*Saissetia oleae* (Bern.) is at times of considerable importance on *Citrus* in South Australia and is usually present in small numbers on olive, which is common in the Adelaide district ; small, severe, localised outbreaks that persist for only two or three years are not infrequent on this food-plant. The Coccid has only one complete generation a year, and no eggs or crawlers are present between May and September. Elsewhere, such discontinuity in the life-cycle has been attributed to the manner of incidence of an important parasite [*R.A.E.*, A **31** 245], but in South Australia, seasonal conditions seem to be partly responsible. In observations in an olive plantation over a period of five years, during which there were always some heavily infested trees though infestation in no case persisted for the whole period, the first crawlers usually occurred in late October, but they did not appear until 25th November in 1946 and 17th December in 1947. First-instar scales were not observed after April. The females become mature in May and remain quiescent until September when they oviposit. The summers in South Australia are hot and dry, with spells of exceptionally hot weather, and the winters relatively cool and wet. There is much evidence that the hot dry spells reduce the numbers of *S. oleae*. In the plantation under observation, infestation was heaviest on the shaded side of the trees, and during the summer of 1946–47, which was relatively cool and wet, *S. oleae* was common and widespread and there was some indication of a partial second generation. Weather conditions affect only the immature stages, however, and parasites and predators were also of importance in determining numbers. The Coccinellid, *Rhizobius ventralis* (Erichs.) was at times numerous where *S. oleae* was abundant and is thought to be chiefly responsible in reducing intense infestation. A Hemerobiid larva also preyed on the Coccids. The commonest parasite was the introduced Encyrtid, *Metaphycus lounsburyi* (How.) which was generally distributed and was sufficiently numerous to interfere with the rearing of *M. helvolus* (Comp.) in glasshouses [**36** 216]. *Quaylea whittieri* (Gir.), a native Encyrtid that attacks *M. lounsburyi*, was found occasionally, and the Elasmid, *Myiocnema comperei* Ashm., was sometimes abundant. Males of an undetermined species of *Myiocnema* were reared from *S. oleae* and also from *Coccus hesperidum* L. ;

it was not common, and is probably a secondary or tertiary parasite. Other parasites reared from *S. oleae* were *Cheiloneurus* sp., of which only females were obtained and which was also reared from *Coccus hesperidum* ; *Coccophagus scutellaris* (Dalm.), which was more abundant in *Coccus hesperidum* and is probably unable to survive the period during which *S. oleae* is scarce unless alternative hosts are present on the plants ; and *Microterys flavus* (How.), which was rare on both Coccids. *Scutellista cyanea* (Mots.) was not obtained, and in view of its usefulness elsewhere [**16** 435] it is suggested that it should be introduced into South Australia.

Borg (Å.). **Ytterligare några parasitangrepp på oljedådra.** [Further Parasite Attacks on *Camelina*.]—*Växtskyddsnotiser* 1952 no. 2 pp. 20–23, 2 figs. Stockholm, 1952.

*Camelina* grown in Sweden in 1950 and 1951 [*cf. R.A.E.*, A **40** 218] was attacked by *Ceuthorrhynchus rapae* Gylh., usually not seriously, and possibly also by *C. erysimi* (F.), adults of which were taken in circumstances suggesting that they had developed on the crop.

Ossiannilsson (F.). **De svenska päronbladloppornas synonymik.** [The Synonymy of the Swedish Pear Psyllids.]—*Växtskyddsnotiser* 1952 no. 2 pp. 29–30. Stockholm, 1952.

The Psyllids that occur on pear in Sweden were formerly considered to belong to five distinct species, *Psylla pyri* (L.), *P. pyrarboris* Šulc, *P. pyricola* Först., *P. simulans* Först., and *P. pyrisuga* Först. H. A. Schaefer pointed out in 1949, however, that *P. simulans* is the winter form of *P. pyricola* [*cf. R.A.E.*, A **23** 127], and the author accepts this view, although it cannot be verified until the types are examined. Comparison with Swiss material showed that *P. pyrarboris* is the summer form of *P. pyri*, as described by H. P. Wille in Switzerland [**41** 97]. There are thus only three species present.

Joubert (C. J.). **The White-fringed Beetle.**—*Fmg in S. Afr.* **26** no. 303 pp. 195–197, 4 figs. Pretoria, 1951.

*Graphognathus leucoloma* (Boh.) has recently been found to be established at several places in the south-west of South Africa. Its mode of entry is unknown. It caused serious damage to lucerne and beans at Vredendal and Koekenaap during the summer of 1950–51, and investigations showed that it had been injurious to crops in the Vredendal area for at least five years and had been present in Stellenbosch since 1946 and at Rosebank since 1940, though it had caused no serious damage there. The plants attacked also included potato, sweet potato, cabbage, and ornamentals. All stages of the weevil are briefly described, and an account is given of its bionomics and control based on work in the United States [*cf. R.A.E.*, A **41** 91]. Observations in the early part of 1951 indicated that its life-history in South Africa did not differ essentially from that in the United States.

Hainsworth (E.). **Tea Pests and Diseases and their Control with special Reference to North East India.**—9×6 ins., xi+130 pp., 16 pls. Cambridge, W. Heffer & Sons, Ltd., 1952. Price 18*s*.

This handbook for tea planters collates information that has hitherto been scattered throughout the literature on the principal diseases and insect and other pests that attack the crop in north-eastern India. Most of the pests are dealt with according to the part of the plant they damage, but those that

attack nursery stock are considered together ; notes are given on their appearance and habits and rather more detailed information on the injury caused and control. The advantages and disadvantages of various types of spraying and dusting equipment are summarised, with instructions for spraying and a list of the equipment needed. Two concluding chapters deal very briefly with the approval scheme for insecticides used on tea in India and the cost of spraying ; the latter includes a spray calendar.

**International Plant Protection Convention.** [*In English, French & Spanish.*]—34 pp. Rome, Fd Agric. Org. U.N., 1951.

This Convention was drawn up in view of the desirability of establishing international co-operation in the control of pests and diseases of plants and plant products, and supersedes earlier international conventions. The contracting governments undertake to adopt the legislative, technical and administrative measures specified in it and in supplementary agreements to be proposed by the Food and Agriculture Organisation of the United Nations on the recommendation of a contracting government or on its own initiative. Each contracting government is to provide an official plant protection organisation to undertake the inspection of growing plants and of plants and plant products in store and in transit, the inspection, disinfestation and disinfection of plants, plant products and, where practicable, other commodities liable to act as carriers of pests or diseases moving internationally, the certification according to an approved formula of plants and plant products, and education and research in plant protection. Each government further agrees to conform to specified conditions in relation to import regulations, to co-operate in the establishment and maintenance of a world reporting service on plant diseases and pests and the establishment of regional plant protection organisations in appropriate areas, and to participate in campaigns against particular pests or diseases. The Convention can be extended to any territories for the international relations of which a signatory or adhering government is responsible by declaration by that government. It was to be signed by 1st May, 1952 and ratified at the earliest possible date thereafter, and to come into force when ratified by three signatory governments, after which it was to be open for adherence by non-signatory governments. Notice of one year is required for denunciation.

Ling (L.). **Digest of Plant Quarantine Regulations. New Edition.**—*FAO Developm. Pap.* no. 23 Agric., vi+164 pp. Rome, 1952.

This publication, which was issued to provide information for member nations of the International Plant Protection Convention [see preceding abstract] contains digests of the laws and regulations governing the importation of plants and plant material in force in 40 countries up to late 1952.

Papers noticed by Title only.

Ross (D. A.). **Key to the Puparia of the Dipterous Parasites of** *Choristoneura fumiferana* **Clem.** [in Canada.]—*Canad. Ent.* **84** no. 4 pp. 108–112, 15 figs. Ottawa, 1952.

Melis (A.). **Elenco delle principali specie di insetti che hanno prodotto infestazioni degne di nota in Italia durante l'anno 1948.** [A List of the principal Species of Insects that caused Infestation worthy of Notice in Italy in the Year 1948.]—*Redia* **33** pp. xxi–xxvii. Florence, 1948. **Elenco . . . 1949.**—*Op. cit.* **34** pp. xix–xxxii. 1949. [*Cf. R.A.E.*, A **36** 141 ; **39** 96.]

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